GIFFORD PINCHOT NATIONAL FOREST

FIRE MANAGEMENT PLAN

Reviewed and Updated by _____ Date _____

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Interagency Federal fire policy requires that every area with burnable vegetation must have a Fire Management Plan (FMP). This FMP provides information concerning the fire process for the Gifford Pinchot National Forest and compiles guidance from existing sources such as but not limited to, the Gifford Pinchot National Forest Land and Resource Management Plan (LMP), national policy, and national and regional directives.

The potential consequences to firefighter and public safety and welfare, natural and cultural resources, and values to be protected help determine the management response to wildfire. Firefighter and public safety are the first consideration and are always the priority during every response to wildfire.

The following chapters discuss broad forest and specific Fire Management Unit (FMU) characteristics and guidance.

Chapter 1 introduces the area covered by the FMP, includes a map of the Gifford Pinchot National Forest, addresses the agencies involved, and states why the forest is developing the FMP.

Chapter 2 establishes the link between higher-level planning documents, legislation, and policies and the actions described in FMP.

Chapter 3 articulates specific goals, objectives, standards, guidelines, and/or desired future condition(s), as established in the forest's LMP, which apply to all the forest's FMUs and those that are unique to the forest's individual FMUs.

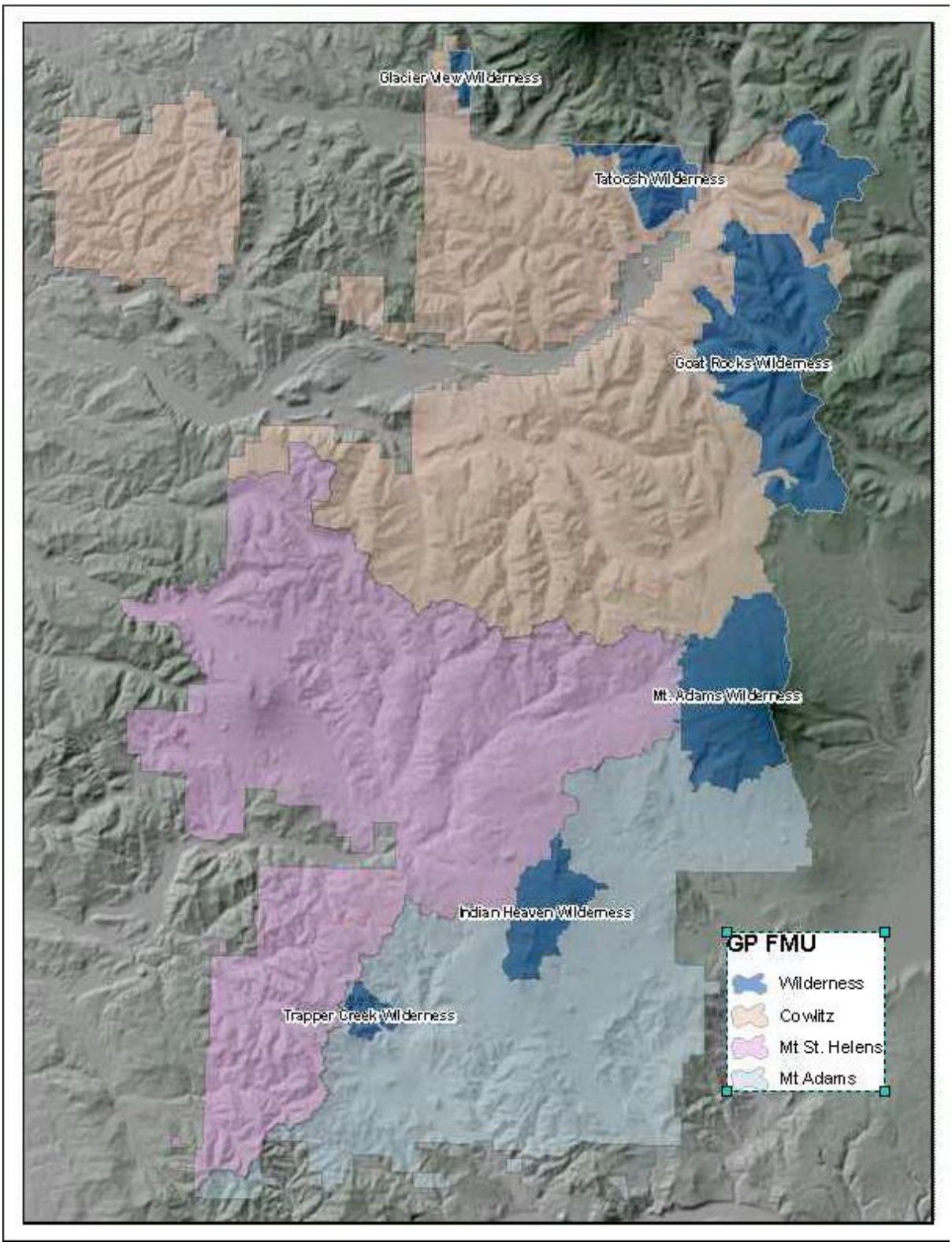
Chapter 1. INTRODUCTION

The Gifford Pinchot National Forest (GPNF) developed this FMP as a decision support tool to help fire personnel and decision makers determine the management response to an unplanned ignition. FMPs do not make decisions. Instead, they provide information, organized by FMUs, which provides a finer scale summarization of information than is possible at the forest level. These descriptions bring specific detail about the identifiable areas on the ground. FMPs are not static documents. They will evolve and be revised as conditions change on the ground and as modifications are made to the Gifford Pinchot LRMP.

The GPNF is located in southwest Washington State and stretches along the western slopes of the Cascade Mountains. The Columbia River is to the south, Mount Rainer National Park to the north, with an intermix of State and private ownership to the west. The eastern Forest boundary is shared with the Mt Baker-Snoqualmie and Okanogan-Wenatchee National Forests, the Yakama Indian Reservation and some State and private ownership.

Consisting of over 1.4 million acres of land, the Forest is predominately forested with Western hemlock and Douglas-fir trees at lower elevations and Silver fir, Noble fir and Mountain hemlock trees at higher elevations up to the timberline. Elevations range from just over 500 feet in the southwestern portion up to persistently snow covered mountaintops above 10,000 feet within the Cascade mountain range. The majority of the forest falls within 2000 to 3000 foot elevation, the highest point being Mt Adams at 12,281 feet. A map of the forest and general vicinity is shown in Figure 1.1.

Figure 1.1 Forest and General Vicinity Map


Glacier View Wilderness
Tatoosh Wilderness
Goat Rocks Wilderness
Mt. Adams Wilderness
Indian Heaven Wilderness
Trapper Creek Wilderness
GP FMU
Wilderness
Cowlitz
Mt St. Helens
Mt Adams

Chapter 2. POLICY, LAND MANAGEMENT PLANNING, AND PARTNERSHIPS

The regulations and policy in the following documents guide the fire management as outlined in this FMP.

2.1. National and Regional Fire Management Policy

Forest Service policy and direction that are relevant to this plan include:

- 1995 Federal Wildland Fire Management Policy and Program Review (January 2001)
- National Fire Plan
- Forest Service Manual 5100
- Forest Service Handbook 5109
- Guidance for Implementation of Federal Wildland Fire Management Policy (February 13, 2009)

2.2. Gifford Pinchot National Forest Land and Resource Management Plan

- Gifford Pinchot National Forest Land and Resource Management Plan, Amendment 11, February 1995
- Gifford Pinchot National Forest Land and Resource Management Plan, Amendment 11, Update #2, June 22, 1995
- Gifford Pinchot National Forest Land and Resource Management Plan, Amendment 11, Update #3, June 1, 1998
- Gifford Pinchot National Forest Land and Resource Management Plan and Record of Decision, 1990

2.3. Partnership

Collaboration with Regional, State, local stakeholders, tribes and the public occurs on several levels consistent with the Framework for Collaboration (10-Year Comprehensive Strategy, August 2001). Extensive coordination and public involvement was accomplished in development of the Forest Land and Resource Management Plan.

The Gifford Pinchot and Mt Hood National Forests share key Fire Staff Officers and cooperatively organize and coordinate wildland fire management programs. Dispatching for the two Forests and the Columbia River Gorge National Scenic Area are coordinated through the Columbia Cascade Communication Center.

Separate Fire Management Plans were completed for the Gifford Pinchot and Mt Hood National Forests, the Columbia River Gorge National Scenic Area and other federal partners.

This fire management plan has been developed through coordination with adjacent State, tribal and rural cooperators. Key collaborators include Washington Department of Natural Resources, Yakama Nation and Yakama Agency Bureau of Indian Affairs, Columbia River Gorge National Scenic Area, Okanogan-Wenatchee National Forest, Mt Rainer National Park, the US Fish and Wildlife Service and the counties of Clark, Cowlitz, Klickitat, Lewis, Yakama, Pierce and Skamania.

Central Cascades Fire Planning Unit
The Gifford Pinchot National Forest falls within the Central Cascades Fire Planning Unit (NW_WA_007). The Central Cascades Fire Planning Unit (CC-FPU) functions as the geographic fire-planning component of the Federal Fire Program Analysis – Preparedness Module (PM) planning process.

The CC-FPU serves to facilitate the landscape-scale development of the FPA Planning System and is purposefully designed as an interagency planning unit, consisting of the following federal agencies:

- DOI Fish & Wildlife Service Region 1
- DOI Bureau of Indian Affairs – Yakama Agency
- DOI Bureau of land Management – Spokane District
- USDA Forest Service
    - Columbia Gorge National Scenic Area
    - Gifford Pinchot National Forest
    - Mt. Hood National Forest

Chapter 3. Fire Management Unit Descriptions

The primary purpose of developing FMUs in fire management planning is to assist in organizing information in complex landscapes. FMUs divide the landscape into smaller geographic areas to easily describe safety considerations, physical, biological, social characteristics and to frame associated planning guidance based on these characteristics.

The following information, including the summaries of fuels conditions, weather and burning patterns, and other conditions in specific FMUs, helps determine the management response to an unplanned ignition and provides a quick reference to the strategic goals in the Gifford Pinchot LRMP.

3.1. Fire Management Considerations Applicable to All Forest Fire Management Units

The management direction and goals in the Forest Plan describe the desired future conditions of land and resources for the Gifford Pinchot National Forest and the planning, analysis, monitoring, and adjustments that must be done to make these goals a reality. Full attainment of these goals and objectives can be influenced by Congressional budget allocations, changed circumstances, or new information. National, regional, and Forest-wide fire management goals and objectives are identified below.

The Guiding Principles of Federal Wildland Fire Management Policy (FWFMP) are the foundation that guides development of this FMP.

Guiding Principles

1. Firefighter and public safety is the first priority in every fire management activity.
2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.
3. Fire Management Plans, programs, and activities support land and resource management plans and their implementation.
4. Sound risk management is a foundation for all fire management activities.
5. Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management.
6. Fire Management Plans and activities are based upon the best available science.
7. Fire Management Plans and activities incorporate public health and environmental quality considerations.
8. Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.
9. Standardization of policies and procedures among federal wildland fire management agencies is an ongoing objective.

The goals for Fire Management on the Gifford Pinchot National Forest have been expanded from those outlined in the Forest Plan. They tier from and are closely aligned with both national and regional fire management goals and fire policy direction. The following are the fire management goals that will guide development of this FMP.

- Every fire management activity is undertaken with firefighter and public safety as the primary consideration.
- Fire Management program activities are aligned to fully complement one another in support of an ecological approach to resource management.
- Fire-related considerations are integrated into land management planning alternatives, goals and objectives.
- Fires are managed using the full range of wildland and prescribed fire options to protect, enhance and restore resources and developments within and adjacent to the Gifford Pinchot National Forest.
- Fire managers collaborate with other federal and state land management agencies, air regulators, and the public to coordinate fire management activities which may impact private or non-forest lands and/or public health

The accomplishment of these goals contribute in meeting the forest plan standards, they also contribute to meeting regional and national strategic goals such as the 10-year Comprehensive Strategy, the National Fire Plan as well as wildland fire policy.

Standards and guidelines provide a detailed comprehensive strategy to move toward the desired conditions. The Forest-wide standard and guidelines including, management response to wildland fire occurring in LRMP management areas, goals and desired condition are described in section 3.1.1 of this plan.

LRMP Management Area Desired Future Condition states the desired condition that management actions should maintain or move toward.

MANAGEMENT RESPONSE TO WILDLAND FIRE

FWFMP defines ***wildland fire*** as a general term describing any non-structure fire that occurs in the wildland. Wildland fires are categorized into two distinct types:

a) Prescribed Fires – Planned ignitions
b) Wildfires – Unplanned ignitions or prescribed fires that are declared wildfires

FWFMP allows a wildland fire to be concurrently managed for one or more objective and objectives may change as the fire spreads across the landscape.

Prescribed Fires – Planned Ignitions

Management ignited prescribed fires are used to achieve specific objectives, including altering, maintaining, or restoring vegetative communities; achieving desired resource conditions; and to protect life, property, and values that would be degraded and/or destroyed by wildfire.

Use of planned ignitions is not addressed in this FMP. Planned ignitions are addressed in project specific NEPA documents and as described in prescribed fire implementation plans.

Prescribed fire policy includes FSM 5140 – Fire Use and the Interagency Prescribed Fire Planning and Implementation Procedures Guide, July 2008.

Wildfires – Unplanned ignitions or prescribed fires that are declared wildfires

FWFMP for initial action on human-caused wildfire is to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.

The LRMP describes three possible responses to wildland fire, including confine, contain and/or control. These management responses provide flexibility toward meeting suppression objectives and the desired future condition objectives of each management area.

The management responses to wildland fire to be considered are described as:

- Confine – To restrict the fire within boundaries established either prior to the fire, during the fire, or in an escaped fire situation analysis, (the current tool is WFDSS).
- Contain – To surround a fire and any spot fires it produces with a control line, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions.
- Control – To complete the control line around a fire and any interior islands to be saved, burn out any unburned areas adjacent to the fire side of the control line, and cool all hot spots that are immediate threats to the control line.

Table 3.1 Summary of Management Response Options

Designated Area Name: Congressionally Reserved Areas			
Management Area	**Confine**	**Contain**	**Control**
Mt St Helens NVM	X	X	X
Wilderness	X	X	X

Designated Area Name: Administratively Withdrawn Areas			
Management Area	**Confine**	**Contain**	**Control**
Administrative Sites			X
Developed Recreation			X
Research Natural Area	X	X	X
Roaded Recreation w/o Timber Harvest		X	X
Special Interest	X	X	
Unroaded Recreation w/o Timber Harvest		X	X
Utility Sites & Corridors			X
Wild & Scenic Rivers			X
Wildlife Special	X		X

Designated Area Name: Late-Successional Reserves and Late Successional Areas			
Management Area	**Confine**	**Contain**	**Control**
Administrative Sites			X
Developed Recreation			X
Experimental Forest			X
General Late-Successional Reserve			X
Mountain Goat			X
Roaded Recreation			X
Special Interest			X
Unroaded Recreation w/o Timber Harvest			X
Utility Sites and Corridors			X
Visual Emphasis			X
Wild & Scenic Rivers			X
Wildlife Special			X

Designated Area Name: Matrix			
Management Area	**Confine**	**Contain**	**Control**
Deer & Elk Winter Range		X	
General Forest		X	X
Mountain Goat	X	X	X
Roaded Recreation w/ Timber Harvest		X	X
Scenic & Recreational Rivers			X
Visual Emphasis			X

Note: Management Area's may occur in more than one Designated Area. See LRMP or NWFP.

In all cases, the management response to wildland fire shall first be responsive to the #1 FWFMP guiding principle:

1. Firefighter and public safety is the first priority in every fire management activity.

LRMP management requirements allow for some management response flexibility.

Selected management response will be based on:

- Firefighter and public safety
- LRMP management response requirements
- Management of costs in relation to values at risk
- Environmental and fire behavior factors such as fire intensity level, seasonal dryness, predicted weather and season ending events and other long-term assessments
- Anticipated fire effects such as those that move toward or achieve desired conditions or affect air quality
- Other factors specific to an incident or complex of incidents

Management Requirements for response to a wildland fire on the Gifford Pinchot Forest are based on Northwest Forest Plan (LRMP, Amendment 11) Riparian Reserve Standards and Guidelines for Fire Management. Strategic objectives include:

- FM – 1 Design fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.
- FM – 2 Locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside Riparian Reserves. If the only suitable location for such activities is within the Riparian Reserve, an exemption may be granted following review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements. Use an interdisciplinary team to predetermine suitable incident base and helibase location if in Riparian Reserves.
- FM – 3 Minimize delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or following review and recommendation by a resource advisor, when an escape would cause more long-term damage.
    - This direction has been superseded by the Nationwide Areial Application of Fire Retardant on National Forest System Land FEIS and ROD, December, 2011. Page two of the ROD states application of retardant in avoidance areas is only acceptable when, "…human life or public safety is threatened and retardant use within avoidance areas could be reasonably expected to alleviate that threat."
    - Additional direction regarding retardant application can be found in the FEIS and ROD
- FM – 5 Immediately establish an emergency team to develop a rehabilitation treatment plan needed to attain Aquatic Conservation Strategy objectives whenever Riparian Reserves are significantly damaged by wildfire burning outside prescribed parameters.

- Other – In Riparian Reserves, the goal of wildfire suppression is to limit the size of all fires. When watershed and/or landscape analysis or province-level plans are completed and approved, some natural fires may be allowed to burn under prescribed conditions. Rabidly extinguishing smoldering coarse woody debris and duff should be considered to preserve these ecosystems elements. In Riparian Reserves, water drafting sites should be located and managed to minimize adverse effects on riparian habitat and water quality, as consistent with Aquatic Conservation Strategy objectives.

Type 3, 4 and 5 Incident Commanders will base their tactics on management response guidelines described in this plan and specific requirements outlined in their Delegation of Authority to manage Type 3, 4 and 5 incidents. Extended attack Type 3 Incident Commanders may receive a supplemental Delegation of Authority and Leaders Intent expectations.

Type 1, 2 and 3 Incident Commanders and Incident Management Teams will be provided with an incident specific Delegation of Authority and a Leaders Intent document detailing Line Officer expectations. Incident Commanders and Incident Management Teams will base their tactics on management response guidelines described in this plan and specific requirements outlined in their Leaders Intent document.

Wildfires – Analysis and Documentation of Unplanned Ignitions

Beginning in 2009, the Wildland Fire Decision Support System (WFDSS) replaced the Wildland Fire Support Analysis (WFSA) as a decision support system. When analyzing wildland fire incidents to determine management response, WFDSS is the tool that will be used to support management decisions.

WFDSS is appropriate for all incident complexity levels (i.e., Type 5, 4, 3, 2, and 1 Incidents). For all complexity levels, the decision making process for selecting a management response(s) will be analyzed and documented utilizing WFDSS.

Described above are Northwest Forest Plan (LRMP, Amendment 11) strategic objectives and management requirements that are included in WFDSS and guide management response.

Generally, the level of planning, analysis and documentation increases with incident complexity level, with Type 5 incidents requiring minimal analysis and documentation and a Type 1 incidents requiring more intensive analysis and documentation.

Table 3.2 provides a reference tool that may be used as a guide when determining the level of analysis, planning, and documentation necessary for fires of various incident complexities and selected management response.

Table 3.2 Level of WFDSS Planning, Analysis and Documentation Requirements for Selected Management Response(s)

	LEVEL 1	LEVEL 2	LEVEL 3
Suggested Incident Complexity	Initial Attack (Type 3, 4, and 5) incidents: Pre-planned response for Initial Attack fires follows pre-planned response from FMP and annual Delegation of Authority to Manage Type 3, 4 and 5 Incidents.	Extended Attack and/or short-term duration (Type 1, 2, 3, 4, or 5) incidents and fires managed for safety, access or resource benefit objectives.	Extended Attack and/or mid to long-term duration (Type 1, 2, 3, 4 or 5) incidents:
Objectives	Following pre-planned response from FMP and annual Delegation of Authority to Manage Type 3, 4 and 5 Incidents.	• Strategic Objectives and Management Requirements pre-loaded by Fire Management Unit • Incident Objectives and Requirements tiered from Strategic Objectives and Management Requirements	• Strategic Objectives and Management Requirements pre-loaded by Fire Management Unit • Incident Objectives and Requirements tiered from Strategic Objectives and Management Requirements
Course of Action	Following pre-planned response from FMP and annual Delegation of Authority to Manage Type 3, 4 and 5 Incidents.	• Strategic Direction for the Course of Action (COA) tiered from the Incident Objectives and Requirements • If appropriate, Management Action Points (MAPs) are Considered	• Strategic Direction for the Course of Action (COA) tiered from the Incident Objectives and Requirements • If appropriate, Management Action Points (MAPs) are Considered
Documentation Required	Minimal Documentation if following pre-planned response from FMP and annual Delegation of Authority to Manage Type 3, 4 and 5 Incidents. Alternate management response fires, such as indirect action for safety or access considerations or resource benefit purposes requires a Resource Benefit fire decision document (DAR-Decision Analysis Report). Unplanned ignitions requiring a DAR will most likely require a level 2 or 3 level of analysis and planning	More Documentation requirements Consider: • Fire Behavior Models • Values Inventory • Relative Risk/Response Level Charts • Resource availability to complete COA • Cost & cost development method	Most Documentation Requirements Consider: • Long term fire • Expense • Evaluation of fire environment, values and the landscape • More modeling • Documentation detail necessary for management response • Assessment of resources necessary and available to achieve the decision and objectives Things to Include: • Fire Behavior Models • Values at Risk • Relative Risk/Response Level Charts • Resources availability to complete the COA • Cost projections & how cost was developed
Agency Administrator Signature Required	**It Depends –** • No signature is required – If following pre-planned response from FMP and annual Delegation of Authority to Manage Type 3, 4 and 5 Incidents. • Signature is required – If there is a decision made to use an alternate suppression response, for safety or access considerations or resource benefit.	Yes	Yes

Concepts in a WFDSS website article titled: *Response Levels and Wildland Fire Decision Support System Content Outline* were used to develop this reference tool.

3.1.1. Gifford Pinchot Land and Resource Management Plan and FMU Guidance

LRMP guidance regarding response is in table 3.1.

Designated Areas are identified as follows:

1. Congressionally Reserved Areas
2. Administratively Withdrawn Areas
3. Late-Successional Reserves and Managed Late Successional Areas
4. Matrix

Management Area descriptions include fire management unit (FMU), goals, desired future condition, fire protection standards & guidelines and non-fire protection standards & guidelines that should be considered. User note: Management Areas may fall within more than one Designated Area.

3.1.2. Physical Characteristics that Apply to All Fire Management Units

Two weather patterns have the greatest effect on fire behavior or resistance to control on the forest, the thermal trough and marine push. These patterns may occur independently of one another or in succession as the thermal trough passes to the east of the Cascades a marine push may move in behind the trough. The effects of which are different on each side of the Cascades.

The thermal trough creates what are regionally referred to as east wind events. The thermal trough will build along the coast creating an area of low pressure. As a result, winds originating in Eastern Oregon/Washington will develop as east winds bringing warm dry air to the west side of the Cascades. This wind will increase in speed through saddles and gaps and accelerate downhill as well; though some areas may be sheltered from the east wind. However, all areas west of the Cascades will experience very low minimum RH with little recovery overnight. This enables wind driven spread in areas directly impinged by east winds, terrain driven spread in areas sheltered from the wind, and active burning through the night. Thermal troughs associated with high Haines days or atmospheric instability create a very high potential for large fire growth near the crest. September and October are months during the fire season this most frequently occurs.

A marine push may occur as the thermal trough moves off to the east, but a marine push may also occur independently of the thermal trough. The moderate/strong marine push brings moist air to the west side of the Cascades but also creates a west winds and instability on the east side of the Cascades. A Foehn effect may also occur as the Cascades form a barrier to moisture moving westward and causing warm dry air to rush down the east slope of the Cascades.

When a thermal trough is forecasted for the area, expect strong easterly winds, very low minimum RH, and little recovery and active fire spread through the night. This pattern may persist for several days. When a moderate or strong marine push is forecasted, the east slope of the Cascades should expect gusty westerly winds, instability with development of thunderstorms, and warm, dry, and gusty downhill winds from the crest of the Cascades. In both cases, expect the potential for wind that accelerates through the gaps and gorge.

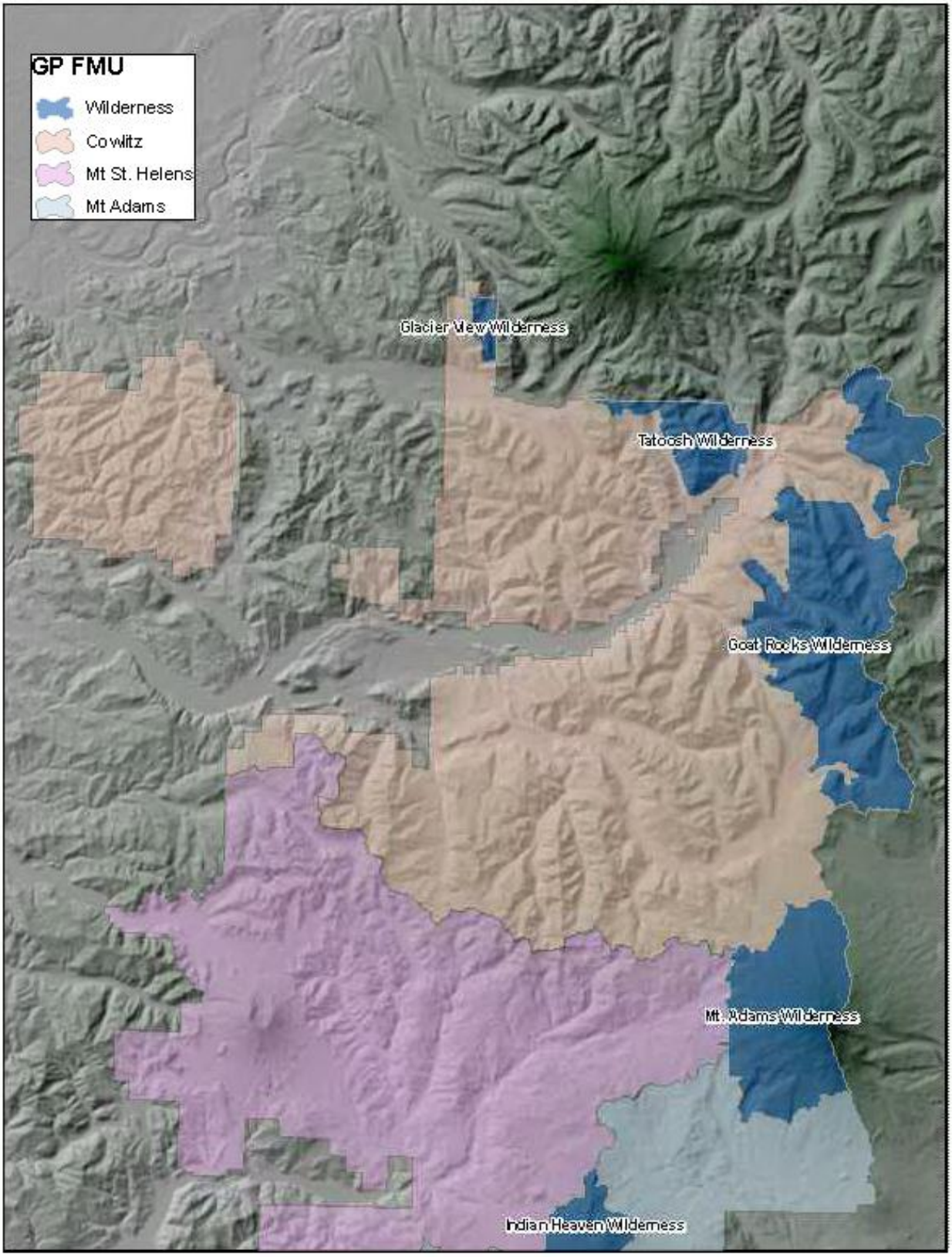
3.2 - A. Fire Management Considerations for Specific Fire Management Units

3.2.1 - Cowlitz Valley

3.2.1.1 FMU Snap Shot

- **FMU Name:** Cowlitz Valley
- **Fire Behavior Indicator:** Energy Release Component (ERC)
  - 90^{th} – 40
  - 97^{th} – 47
- **NFDRS Weather Station:** HAGAR RAWS – NWSID 451115 and ORR CR RAWS – NWSID 451919
- **Acres/Agency:** 550,800 acres
- **Predominant Vegetation Types:** National Fire Danger Rating System fuel model G represents the fuel conditions within this FMU. The primary fuel model is represented by dense stands of mature Douglas-fir with heavy accumulations of ground litter and large woody materials.
- **IA Dispatch Office:** Columbia Cascade Communication Center
- **LRMP options available for management response:** Fire suppression strategies depend upon specific Management Area standards and guidelines, alternative suppression strategies to consider include confine, contain and control. Section 3.1.1. Gifford Pinchot Land and Resource Management Plan *and FMU* Guidance in Table 3.1 of this document, summarizes management response suppression strategies for specific Management Areas.

Figure 1.2 Cowlitz Valley FMU



3.2.1.2 - FMU Guidance

- **Desired Conditions, Objectives, Guidelines, Goals and Standards:** Section 3.1.1. Gifford Pinchot Land and Resource Management Plan *and* Table 3.1 provides a summary of guidance for this FMU.

3.2.1.3 - FMU Characteristics

3.2.1.3.1 Safety

Firefighter and public safety is the primary concern. Limited accessibility, steep terrain, and areas of heavy timber can challenge the efficacy and safety of suppression efforts. Where these concerns arise, suppression tactics that minimize threats to firefighter and safety will be employed.

- Fire fighter and public safety will remain the utmost priority. Terrain, accessibility, and potential fire behavior will influence fire management decisions.
- Accessibility: Roadless land allocations or poor road conditions may limit accessibility. Ingress and egress will be clearly marked and addressed in pre-engagement safety briefings.
- Lava beds: travel and navigation may be difficult over lava flows.
- Aviation hazards: a map of known aviation hazards on the forest is available.
- Driving: Roads are often primitive and shared by other forest users. Defensive driving is required at all times. Caution for wildlife and in areas of poor visibility due to sun/shade and blind turns should be taken. Traffic laws are to be obeyed at all times, including en route to an incident.
- Wildfires that have the potential to affect the wildland urban interface will follow a control strategy. Firefighting personnel will be educated in additional threats associated with fires in the wildland urban interface.
- Public use: Prevention efforts will focus on high public use areas. In the event of an incident, care will be taken to inform and evacuate the public where necessary to ensure their safety.
- Smoke: Communities most likely to be affected by smoke from fires in the Cowlitz Valley FMU are Randle, Packwood, High Valley and Morton. Larger fires occurring under East Wind conditions may affect the Chehalis area as well as the I-5 corridor. Smoke may also affect developed and undeveloped recreation areas. Smoke impacts will be considered during daily incident evaluations.
- Weather: Mountain weather is unpredictable. Thunderstorms and instability in the atmosphere contribute to fire ignition as well as fire spread. A common thunderstorm track along the Cascades passes over the Cowlitz Valley FMU, often bringing lighting in June and July.

3.2.1.3.2 Physical Characteristics

- The Cowlitz Valley FMU encompasses the entire ranger district on the northern half of the forest. Major watersheds include the upper Cowlitz,

Nisqually, Puyallup and Chehalis river drainages. Elevations range from 1000 feet in the river bottoms to over 6000 feet or timberline on the major peaks.

3.2.1.3.2.1 Values at Risk

- **Value:** Cispus Environmental Learning Center
- **Consequence:** High
- **Narrative:** Public Safety. The Learning Center is a group of Forest Service owned buildings operated under a Granger-Thye permit to the Association of Washington School Principals. The center is for educational purposes and is a year round facility. Expect the evacuation of Staff and students. Infrastructure consists of Residential and Educational buildings.

  A Structure Protection Plan for Cispus Environmental Learning Center was created during the Langille Fire in 2009. The Protection Plan is found in The Langille Fire Level 3 Assessment on page 69.

Facility	LATITUDE	LONGITUDE	Township, Range, Section
Cispus Learning Center	46° 26’ 12.00”	121° 50’ 54.00”	11N, 08E, 17

- **Value:** Recreation (Campgrounds (CG), Campgrounds with Trailheads (TH), Horse Camps (HC), Picnic Sites (PG), Observation Sites (OS) and Interpretive Sites (IS))
- **Consequence:** High
- **Narrative:** Public Safety. All listed high values of risk due to infrastructure, public use and potential evacuation. Infrastructure will consist of some wood constructed buildings, toilets, covered picnic areas, sings and bulletin boards, and parking areas. Public use in this area will vary depending on the time of year. Typically, the heaviest period of use would be July through October. Trigger points for protection and evacuation shall be identified.
- **Specific Sites:**

CAMP GROUND	LATITUDE	LONGITUDE	Township, Range, Section
Adams Fork CG	46° 20’ 21.88”	121° 38’45.80”	10N, 09E, 24
Big Creek CG	46° 44’ 04.92”	121° 58.’04.19”	14N, 07E, 06
Blue Lake Creek CG	46° 24’ 13.48”	121° 44’07.76”	11N, 09E, 30
Cat Creek CG	46° 20’ 49.70”	121° 36’25.93”	10N, 10E, 18
Chain-Of-Lakes CG	46° 17’ 38.14”	121° 35’39.41”	09N, 10E, 05
Cody HG	46° 21’ 48.0”	121° 34’ 09.0”	09N, 08E, 11
Horseshoe Lake CG	46° 18’ 33.32”	121° 33’55.46”	10N, 10E, 33
Iron Creek CG and TH #187	46° 25’ 51.36”	121°.59’03.11”	11N, 07E, 19
Iron Creek PF	46° 25’ 37.0”	121° 58’ 56.0”	11N, 08E, 11
Keenes HC	46° 18’ 31.95”	121° 44.06”	10N, 10E, 34

Killen Creek CG	46° 17’ 39.63”	121° 32’53.31”	09N, 10E, 03
La Wis Wis CG and PG	46° 40’ 30.04”	121° 35’ 8.81”	14N, 10E, 29
North Fork CG	46° 27’ 05.50”	121° 47’08.97”	11N, 08E, 11
North Fork Group CG	46° 27’ 09.01”	121° 47’19.62”	11N, 08E, 11
Olallie Lake CG	46° 17’ 20.50”	121° 37’04.64”	09N, 10E, 07
Soda Springs CG & TH	46° 42’ 15.58”	121° 29’ 00.0”	14N, 11E, 18
Summit Creek CG	46° 42’ 36.64”	121° 32’ 08.79”	14N, 10E, 15
Takhlakh Day Use PG	46° 16’ 53.0”	121° 35’ 57.0”	09N, 10E, 08
Takhlakh Lake CG	46° 16’ 40.05”	121° 35’56.44”	09N, 10E, 08
Tower Rock CG	46° 26’ 44.71”	121° 51’56.54”	11N, 07E, 13
Walupt Lake CG, PG & HC	46° 25’ 30.0”	121° 29’ 45.0”	11N, 11E, 19,20

- **Value:** Recreation (CG, TH, HC, PG, OS, IS)
- **Consequence:** Moderate
- **Narrative:** The sites listed below, are moderate due to limited infrastructure. Infrastructure will consist of CXT toilets, paved or unpaved parking, Forest Service signs and bulletin boards. Public use in this area will vary depending on the time of year. Typically, the heaviest period of use would be July through October.
- **Specific Sites:** Berry Patch TH, Blue Lake ORV TH (#119), Packwood Lake TH (#78), Woods Creek Watchable IS and TH (#247), Palisades OS, MT. Rainier-Goat Rocks OS, Council Lake CG, Cat Creek Chimney CG, Yellowjacket Pond PG and Woods Creek Portal Information and Fee Site.

Site	LATITUDE	LONGITUDE	Township, Range, Section
Council Lake CG	46° 15’ 48.22”	121° 37’49.61”	09N, 09E, 13
Cat Creek Chimney CG	46° 21’ 13.0”	121° 37’ 7.0”	10N, 10E, 18
Yellowjacket PG	46° 26’ 13.0”	121° 50’ 16.0”	11N, 08E, 17

- **Value:** Recreation (IS, TH)
- **Consequence:** Low
- **Narrative:** The sites listed below are interpretive sites or geographical areas containing trail(s). They have low consequence due to the limited or nonexistent infrastructure. Forest Service signs and bulletin boards may exist, but are limited. Public use will vary depending on time of year with the heaviest use during the summer months.
- **Specific Sites:**

Interpretive Sites	
Layser Cave IS	Interpretive Site
Quartz Creek Big Trees IS	Interpretive Site
Non-Motorized Tails	
Blue Lake Area	4 Trails
Burley Area	6 Trails
Green River/Strawberry Area	9 Trails
High Lakes Area	4 Trails
Juniper/Langille Ridge Area	1 Trail

Klickitat Area	6 Trails
Randle Area	4 Trails
Sawtooth Area	1 Trail
Tatoosh Area	4 Trails
Motorized Trails	
Green River/Strawberry Area	7 Trails
High Lakes Area	16 Trails
Juniper/Langille Area	8 Trails
Klickitat Area	1 Trail
Pipeline Trail	1 Trail
Randle Area	1 Trail
Sawtooth Area	7 Trails

- **Value:** Historic Buildings (Cultural Resources)
- **Consequence:** High
- **Narrative:** These sites are listed on the National Register of Historic Places or are eligible to be placed on the list. In the event of a fire, a cultural resource advisor (i.e. district archaeologist or forest archaeologist) should be notified following the initial identification of the fire. Protection measures for these sites may include; fire wrapping of historic structures/resources, firebreaks and directional falling.
- **Specific Sites:**

Property Number	Property Name	Const. Date	Historical Status	Township, Range, Section LAT/LONG
Administration Sites				
2460	Barn, Skate Creek	1937	Eligible (Tertiary)	13N, 09E, 10 46° 37’ 33.00” 121° 40’ 13.00”
4116	Burley Mountain Fire Lookout	1935	Eligible	11N, 07E, 25 46° 24’ 26.00” 121° 51’ 56.00”
1573	Garage, Nisqually Guard Station (Big Creek)	1934	Eligible (Secondary)	14N, 07E, 06 46° 43’ 55.00” 121° 55’ 41.00”
1551	Garage, North Fork Guard Station	1938	Listed (Primary)	13N, 09E, 10 49° 27’ 12.00” 121° 47’ 12.00”
4010	High Rock Fire Lookout	1929	Eligible	14N, 07E, 22 46° 41’ 04.00” 121° 54’ 05.00”
1173	Nisqually Guard Station (Big Creek)	1934	Eligible (Secondary)	14N, 07E, 6 46° 43’ 55.00” 121° 55’ 41.00”
1142	North Fork Guard Station	1937	Listed (Primary)	11N, 08E, 11 46° 27’ 12.00” 121° 47’ 12.00”

1166	Packwood Lake Guard Station	1910	Eligible	13N,10E, 21 46° 35’ 45.00” 121° 34’ 05.00”
1167	Walupt Lake Guard Station	1934	Eligible (Tertiary)	11N,11E, 21 46° 37’ 33.00” 121° 40’ 13.00”
Recreation Facilities				
5932	Hinkle Tinkle Trail Shelter	1935	Eligible	14N, 09E, 35 46° 39’ 54.00” 121° 39’ 09.00”
2960	La Wis Wis Community Kitchen	1935	Eligible	14N, 10E, 29 46° 40’ 41.00” 121° 34’ 40.00”
2961	La Wis Wis Flush Toilet	1938	Not Evaluated	14N, 10E, 29 46° 40’ 41.00” 121° 34’ 39.00”
1135	La Wis Wis Guard Station	1937	Listed (Primary)	14N, 10E, 29 46° 40’ 41.00” 121° 34’ 40.00”

A Structure Protection Plan for Burley Lookout was created during the Langille Fire in 2009. The Protection Plan can be found in The Langille Fire Level 3 Assessment on page 75.

- **Value:** High Valley Community (W.U.I)
- **Consequence:** High
- **Narrative:** This is a community north of Packwood, WA. It is in the jurisdiction of Fire District #10 based out of Packwood. There will be increased complexity due to a multiple jurisdictional incident and potential evacuation. It consists of 12 separate communities with poor egress/ingress and multiple year round residences and vacation homes. There is no Community Fire Protection Plan.

Value	LATITUDE	LONGITUDE	Township, Range, Section
High Valley Community	46° 38’ 09.00”	121° 39’ 36.00”	13N, 09E, 10 AND 13N, 9E, 1

- **Value:** Forest Service Boundary with Private Property and/or other Federal Agency, NPS, BIA, NF
- **Consequence:** High
- **Narrative:** Public Safety is the priority. There will be increased complexity due to multiple jurisdictions from state or federal agencies. There is a potential for public evacuation. There is a potential for loss of personal property, property value and possible displacement of property owner for an extended period.

- **Value:** White Pass Ski Area
- **Consequence:** High
- **Narrative:** Public Safety is the priority. There will be increased complexity due to multiple jurisdictions with the ski area and the Okanagan-Wenatchee N.F. This is a recreational area; there will be potential for public evacuation. Multiply private buildings and infrastructure.

Value	LATITUDE	LONGITUDE	Township, Range, Section
White Pass Ski Area	46° 38' 14.00"	121° 23' 29.00"	13N, 11E, 11

- **Value:** Goat Rocks Subdivision
- **Consequence:** High
- **Narrative:** Public Safety is the priority. There will be increased complexity due to multiple jurisdictions from state or federal agencies and public evacuation. There is a potential for loss of personal property, property value and possible displacement of property owner for an extended period.

Value	LATITUDE	LONGITUDE	Township, Range, Section
Goat Rocks Subdivision	46° 38' 46.00"	121° 37' 08.00"	13N, 9E, 1

- **Value:** Timberline Subdivision
- **Consequence:** High
- **Narrative:** Public Safety is the priority. There will be increased complexity due to multiple jurisdictions from state or federal agencies and public evacuation. There is a potential for loss of personal property, property value and possible displacement of property owner for an extended period.

Value	LATITUDE	LONGITUDE	Township, Range, Section
Timberline Subdivision	46° 38' 46.00"	121° 37' 08.00"	13N, 9E, 1

- **Value:** Subdivision adjacent to USFS on FS road 48 (Hager Creek)
- **Consequence:** High
- **Narrative:** Public Safety is the priority. There will be increased complexity due to multiple jurisdictions from state or federal agencies and public evacuation. There is a potential for loss of personal property, property value and possible displacement of property owner for an extended period.

Value	LATITUDE	LONGITUDE	Township, Range, Section
USFS on FS road 48 Subdivision	46° 35' 10.00"	121° 40' 35.00"	13N, 9E, 1

3.2.1.3.3 Biological

- Wildlife habitat: Where habitat exists, northern spotted owls may inhabit the Cowlitz Valley FMU as well as barred owls, pileated woodpeckers, goshawks, and bald eagles. Other wildlife includes blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten.
- Rivers and streams provided habitat to sensitive species of fish.
- Rare, culturally important, and special forest product botanical resources are found in the FMU.

3.2.1.3.4 Resources

- Timber: The timber management program provides wood products and positive economic returns. Suppression strategies will minimize the damage to the timber resource on both National Forest and adjacent lands.
- Late Successional Reserves: The late Successional reserves are designated based on their potential to provide habitat for the northern spotted owl. Suppression strategies will aim to minimize alteration to that desired habitat designation.
- Recreation: The Cowlitz Valley FMU provides developed and undeveloped campsites, as well as opportunities for hunting, fishing, hiking and backpacking. Fires may inconvenience recreational users, by either displacement or visual impacts.
- Cultural resources: Resource Specialists will determine potential effects of activities on cultural resources including Native American spiritual sites and natural resources. The Resource Specialists will provide protection requirements for Historical Structures. To the extent possible, undesirable fire effects will be mitigated.
- Botanicals: The special forest products programs allows the gathering of boughs, beargrass, huckleberries, mushrooms, Christmas trees, firewood, and other botanicals. Threatened and endangered botanical species will be handled in the same way as wildlife. The adaptability or susceptibility of a particular species to fire will be specifically considered along with potential fire intensity and extent.
- Soil: Potential effects of fire to soil include the combustion of surface litter and duff layers, changes in color and chemical composition through the release of carbon, nitrogen and phosphorous in the consumption of live and dead biomass, hydrophobicity, erosion, and debris slides. Low and moderate intensity fires are unlikely to result in effects that significantly influence ecosystem composition and productivity. High severity fires increase the probability for erosion and landslide, but the predominant fire regime over most of the area is one that primarily experiences high severity fire, making these disturbance events within the natural range of variability.
- Wildlife: Northern spotted owls, barred owls, pileated woodpeckers, goshawks, and bald eagles, blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten, and many other wildlife species are found in the Cowlitz Valley FMU. Direct and indirect effects of fire to wildlife vary by

species and the timing and intensity of the burn. They can include reduction or loss of habitat, harassment, displacement, or death from fire, smoke, and disturbance from suppression activities. The potential for sedimentation and loss of fish habitat will be address for all fires occurring near major waterways, particularly where the fuel loadings are outside of their natural range of variability.

3.2.1.4 FMU Fire Environment

Historical fire maps indicate several large fires in the Cowlitz Valley FMU during the mid- to late- 1800s and early-1900s including portions of the Yacolt, Dole Valley, Lewis River, and Willard Fires. A combination of ignition sources contributes to the variability in historical fire regimes in the area. Lightning caused fires were common, but anthropological evidence suggests that local fire regimes were highly influenced by Native Americans and sheepherders who set fires in early fall to improve the production of huckleberries and forage. Railroad companies and escaped silvicultural burns add to the number of human-caused fires. Uncontrolled fires before the era of fire suppression occurred in various landscapes, fuel loading, stages of succession, and under different weather and topographic conditions.

The introduction of fire suppression and federal protection of lands greatly decreased the size and frequency of fires. Recently, most fires occur in summer months, are lightning caused, and are low intensity with some passive crowning. Fire suppression efforts and precipitation that often accompanies summer thunderstorms have kept fires relatively small. Climatic variations dictate the average frequency of lightning storms and ignitions by influencing the potential for storms and fuel flammability. When an ignition occurs, topography, wind, fuel type, and fuel loading play an important role in the impacts of fire on the landscape.

During a typical fire season, fuels dry progressively throughout the season. Fine fuels dry in July and August while coarse fuels reach their maximum dryness in September. These fuel conditions lead to the maximum number of fires occurring in July and August but most large fires occurring in September. Historically, most large fires were human caused, east wind influenced, and in September.

Fuel Models

The 13 standard fire behavior fuel models (FBFMs) were developed to serve as inputs to Rothermel's mathematical surface fire behavior and spread model (Rothermel 1972). They represent distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types. The FBFMs are separated into grass, brush, timber litter, and a slash group. They are further broken down by loading, by size class, fuel bed depth, and moisture of extinction.

A relatively large portion of the Cowlitz Valley FMU is classified as FBFM 10 according to LANDFIRE data. FBFM 10 has the heaviest fuel loading of the timber litter group. Most of the highly productive Douglas-fir- western hemlock forests of the Cowlitz Valley FMU are FBFM 10. Some of the Pacific silver fir and grand fir forests may fall into this category as well. Anderson (1982) describes it as follows:

> The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb wood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in the fuel situation, leading to potential fire control difficulties (i.e., examples insect- or disease-ridden stands, wind-thrown stands, over mature situations with deadfall, and aged light thinning or partial-cut slash).

FBFM 8 is the next most common type, occurring at high elevations, less productive sites, thinned and treated stands, and in some areas on the Cowlitz Valley FMU. The description is below:

> Slow-burning surface fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humilities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. (Anderson 1982)

FBFM 9 is found along some of the riparian areas; it is characterized by long-needle conifers and hardwoods. Overall, fuels dry out slower than FBFM 8 and 10. Fires run through the surface litter faster than FBFM 8 and have longer flame height but with less intensity than FBFM 10 (Anderson 1982).

Less than 5% of the land is grassy meadows (FBFM 1) and shrub-dominated lands (FBFM 5). The grass models have potential for high rates of spread but that fire behavior is extremely unlikely with the amount of annual moisture received in the study areas. These meadows typically stay green and are considered fuel breaks. In FBFM 5, areas where fires are carried by shrubs and other surface fuels, “The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material” (Anderson 1982).

Fire Regimes

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention but including the possible influence of aboriginal fire use (Agee 1993; Brown 1995; Brown and Smith 2000). The LANDFIRE models for biophysical settings used in this analysis classify fire regimes into five groups based on average fire frequency and severity indicated by percent overstory replacement. The above definitions use 25 and 75 percent as severity thresholds between the low, mixed, and replacement regimes. (FRCC Guidebook version 3.0, September 2010)

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+ years	Replacement/ any severity	Generally replacement-severity; can include any severity type in this frequency range

The majority of the Cowlitz Valley FMU falls within fire regime groups III and V. Lands in the western section of the FMU are fire regime group V. Group V has an average fire return interval greater than 200 years.

3.2.1.4.1 Fire Behavior

While major severe fires are infrequent, serious losses, primarily to the timber resource, wildlife habitat, recreation values and aesthetics, are long term in effect. Under high and extreme fire conditions, expected fire behavior includes high intensity, frequent flare-ups, rapid spread and running crown fires. Control is difficult. Mop-up may be expensive. Fire management efforts should minimize acreage burned in recognition of the values at risk. During the NFMAS analysis of FY2000, this FMU had an average workload of 10.1 fires per year.

Most fires that occur are caused by lightning storms. Timber and surface fuels are dry enough to burn in early July although intensity is low and they are easily suppressed.

Large fires are possible in the steep inaccessible areas by late July to early August. Fires spread predictably up canyon – up slope during the day. Nighttime winds will spread fires down canyon in the lower half of the slope, sometimes with considerable acreage increases. These down canyon runs position the fire below upslope fuels setting up conditions for hard upslope runs the next burning period. In the higher elevations, fires that occur in August have the potential to burn at varying intensity levels through the remainder of the fire season. Afternoon relative humidity's can be low (teens to 20's) with gusty erratic winds. Fire spread is influenced by moderate range spotting due to the winds and low humidity's through non-continuous fuels.

Lightning activity generally occurs in July and August, with thunder cells developing along the crest of the Cascades moving from the S, SW to the N or NE. Most of the thunderstorms that occur on the west side of the crest have associated heavy rainfall; this is not always the case however and is rare on the east side of the Cascades. These storms do not necessarily cover the same area every day, but can occur somewhere on the forest for three to five days at a time. The rainfall suppresses some fires, but others can smolder undetected for several weeks following the storms. As in all parts of the forest, the most significant weather event, which has triggered large fire growth, is the presence of East winds on the western slopes of the Cascades. These winds reduce

the relative humidity to the low teens or single digit numbers. Associated high winds, dry fuels and steep forested areas create large fire growth conditions. Conversely large fire growth on the east side of the Cascade crest is associated with strong westerly winds. These winds are created by frontal passages coming from the west or by strong down drafts from thunderstorm activity. Fire season begins to fade around the first of October. Daytime temperatures become cooler and nighttime temperatures are chilly.

The general fire season for the forest is roughly 100 days, beginning in July and ending in mid to late October. Due to the high elevation areas, the season is approximately a month later than the low elevation areas of the forest. This is dependent upon typical winter snowfall and spring snowmelt, which can change rapidly.

Fire exclusion has created stand structures in some places with ladder fuels that will contribute significantly to spotting and crowning potential.

3.2.1.4.2 Weather

Fuel moistures peak in late May to early June, which is dependent upon the ending of the seasonal rains. As the Pacific storm track (jet stream) into western Washington becomes less frequent, precipitation in the Cowlitz Valley FMU begins to diminish. This, combined with longer daylight hours starts the drying trend that leads to fire season. Mild, wet winters and hot dry summers typify the climate of the Cowlitz Valley FMU. Average annual precipitation exceeds 140 inches, much of this occurring in the form of snow. Fine fuels reach their maximum dryness in July and August, while the larger fuels do not usually dry out until September. As a result, the highest number of fires in any given year occurs during July and August (roughly 65%), but most of these are less than ten acres in size. Most of the large fires and virtually all of the severe fires occur during September or from late August to early October. Consequently, the average peak for fire frequency occurs prior to the average peak for fire size.

Two weather patterns have the greatest effect on fire behavior or resistance to control on the forest, the thermal trough and marine push. These patterns may occur independently of one another or in succession as the thermal trough passes to the east of the Cascades a marine push may move in behind the trough. The effects of which are different on each side of the Cascades.

The thermal trough creates what are regionally referred to as east wind events. The thermal trough will build along the coast creating an area of low pressure. As a result, winds originating in Eastern Oregon will develop as east winds bringing warm dry air to the west side of the Cascades. This wind will increase in speed through saddles and gaps and accelerate downhill as well, though some areas may be sheltered from the east wind. However, all areas west of the Cascades will experience very low minimum RH with little recovery overnight. This enables wind driven spread in areas directly impinged by east winds, terrain driven spread in areas sheltered from the wind, and active burning through the night. Thermal troughs associated with high Haines days or atmospheric instability creates a very high potential for large fire growth near the crest. September and October are months during the fire season this most frequently occurs.

In the early July of 2008, Coldsprings Fire exhibited rapid growth when periods of critically dry and unstable air mass development over the Cascade range, along with a Haines index of six created an explosive fire event which burned nearly eight thousand acres of forest lands. Prior to the Cold Springs fire, the largest and most severe fires on the GPNF have all been associated with east winds (Yacolt, Siouxon, Lewis River, Cispus, Dole, Willard, Ruth). All of these large fires with the exception of Cispus were on the south half of the forest where the east winds are most severe. All of the large fires were also preceded by several weeks of extremely hot and dry weather and all but the Willard fire occurred during the month of September.

A marine push may occur as the thermal trough moves off to the east, but a marine push may also occur independently of the thermal trough. The moderate/strong marine push brings moist air to the west side of the Cascades but also creates a west winds and instability on the east side of the Cascades. A Foehn effect may also occur as the Cascades form a barrier to moisture moving westward and causing warm dry air to rush down the east slope of the Cascades.

When a thermal trough is forecasted for the area, expect strong easterly winds, very low minimum RH, and little recovery and active fire spread through the night. This pattern may persist for several days. When a moderate or strong marine push is forecasted, the east slope of the Cascades should expect gusty westerly winds, instability with development of thunderstorms, and warm, dry, and gusty downhill winds from the crest of the Cascades. In both cases, expect the potential for wind that accelerates through the gaps and gorge.

The primary ignition source on the forest continues to be from lightning. Human caused fires continue to increase however as more areas adjacent to the forest are being developed and as visitor use patterns change. Although lightning is less common on the west side of the Cascades than the east side, it still accounts for a large percent of the fire starts (ranging from 35-70%). During the summer season, cells develop and move north along the Cascade Range. These cells are often associated with rain showers as well as dry lightning. The Pacific high dominates summertime weather causing hot temperatures (75-90+ degrees), dry humidity's (30-40%, frequently lower), and low 10-hour fuel moistures (3-5%). Summer rainfall is non-existent except for precipitation from passing thunderstorms, which mainly falls at higher elevations. Fall rains generally return in mid to late October.

The ending of fire season is more variable than the start. Although dwindling sunlight provides less ground heating, season ending moisture is dependent on Pacific storm systems. The location of the jet stream plays a major role in determining the path of the storms. Historically the fire season has ended in October.

3.2.1.4.3 Fire History

Wildfire: Langille Fire	**Discovery:** 7/28/2009 at 1030hours	**Acres:** 485
Incident Complexity: T- 3	**Cause:** Lightning	**Fuel Model:** G
Control: 10/10/2009	**Out:** 11/12/2009	**Cost:** $550,000
Narrative: A lightning fire started on 7/27/2009 and discovered mid-day on 7/28/2009. Twelve smokejumpers, supported by air tankers and helicopters were dispatched to initial attack the fire. Due to extremely steep topography, hot dry weather, gusty winds, and erratic fire behavior the fire eventually exceeded the capabilities of the initial attack forces and declared an escaped fire. A confine / contain management strategy was adopted and a Wildland Fire Management Team was ordered.		

Wildfire: Lost Lake	**Wilderness:** Goat Rocks	**Acres:** 321
Incident Complexity: T- 3	**Cause:** Lighting	**Fuel Model:** G
Control:	**Out:**	**Cost:** $60,000
Ignition Date: 8/05/2003	**Discovery Date:** 8/24/2003	**ERC:** 58
Narrative: The fire was ignited by lightning storm on 8/5/2003 and was discovered on 8/24/2003 by the High Rock Lookout at 2 acres in size. By 9/01, the fire was 5 acres and on 9/2, the fire grew 70 acres spreading upslope with active torching and occasional crowning. On 9/3 the fire grew an estimated 120 acre with the weather in the mid 90's, RH in the low teens and an ERC of 58 (97^{th} – 47). The fire was 320 acres on 9/7 when weather conditions improved to assist in the containment efforts.		

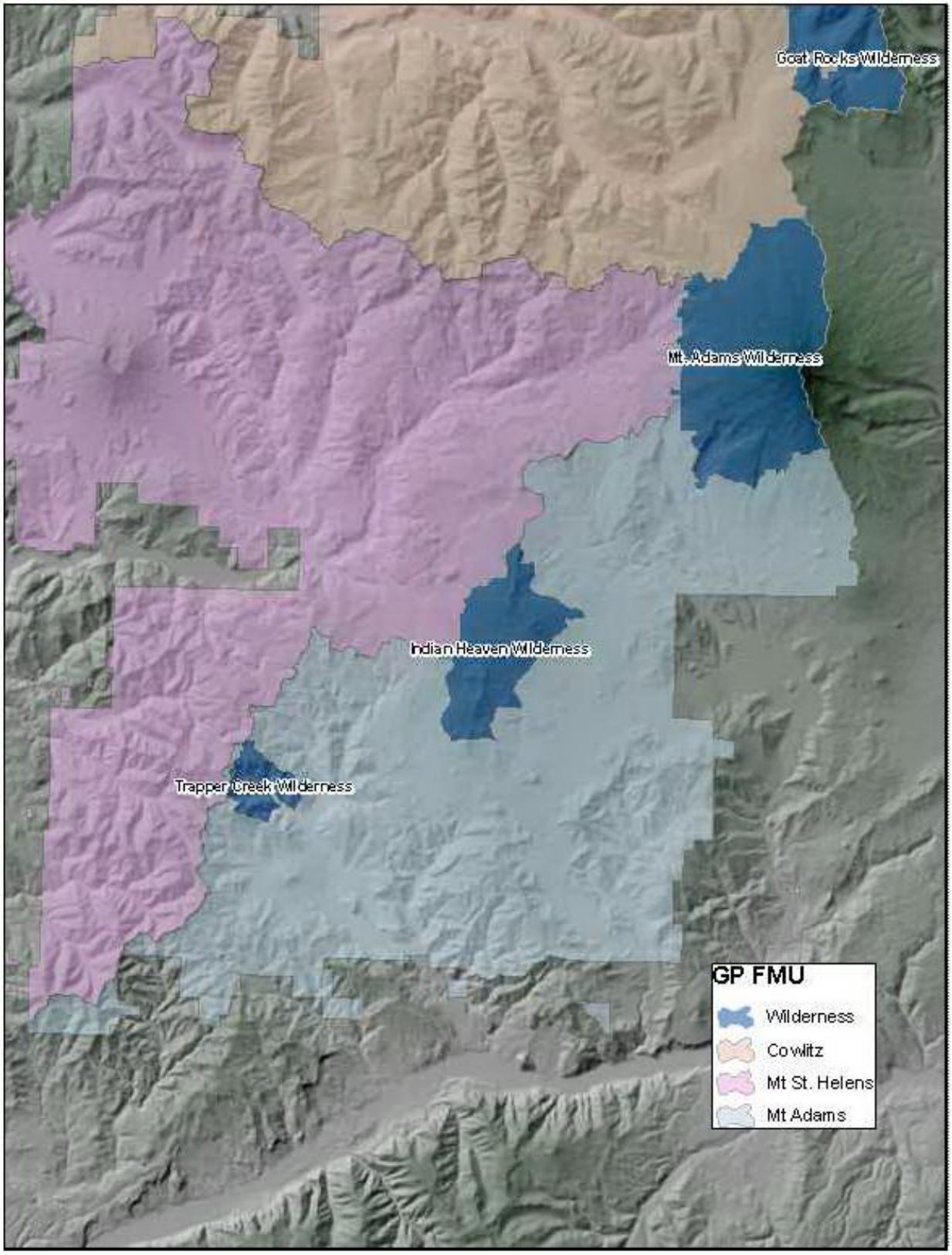
3.2.2 – A. Fire Management Considerations for Specific Fire Management Units

3.2.2.1 Mt Adams FMU Snap Shot

- **FMU Name:** Mt. Adams
- **Fire Behavior Indicator:** Energy Release Component (ERC) Burning Index (BI) Thousand hour fuel moisture (1000 FM)
	ERC	BI	1000 FM
•	90th – 56	56	12
•	97th – 62	63	10
- **NFDRS Weather Station:** Buck Cr. RAWS – NWSID 4511917 and Dry Cr. RAWS – NWSID 451924
- **Acres/Agency:** USFS/ WA-GPF/ Mt. Adams R.D. Total Acres -380,539 including;

  Mt Adams Wilderness -47,122 acres
  Indian Heaven Wilderness -20,844 acres
  Trapper Creek Wilderness -5,954 acres
- **Predominant Vegetation Types:** National Fire Danger Rating System fuel model G represents the fuel conditions within this FMU. The primary fuel model is represented by dense stands of mature Douglas fir with heavy accumulations of surface litter and large woody materials. Where Dry Grand fir occurs on the east side of the FMU fuel accumulations are much greater due to insect and disease outbreaks.
- **IA Dispatch Office:** Columbia Cascade Communication Center
- **LRMP options available for management response:** Fire suppression strategies depend upon specific Management Area standards and guidelines, alternative suppression strategies to consider include confine, contain and control. Section 3.1.1. Gifford Pinchot Land and Resource Management Plan and Table 3.1 of this document, summarizes management response suppression strategies for specific Management Areas.

Figure 3.2 Mt. Adams FMU



3.2.2.2 FMU Guidance

- **Desired Conditions, Objectives, Guidelines, Goals and Standards:** Section 3.1.1. Gifford Pinchot Land and Resource Management Plan *and FMU* Guidance, and Table 3.1 of this document provides a summary of guidance for this FMU.

3.2.2.3 FMU Characteristics

3.2.2.3.1 Safety

Firefighter and public safety is the primary concern. Limited accessibility, steep terrain, and areas of heavy timber can challenge the efficacy and safety of suppression efforts. Where these concerns arise, suppression tactics that minimize threats to firefighter and public safety will be employed.

- Fire fighter and public safety will remain the utmost priority. Terrain, accessibility, and potential fire behavior will influence fire management decisions.
- Accessibility: Roadless land allocations or poor road conditions may limit accessibility. Ingress and egress will be clearly marked and addressed in pre-engagement safety briefings.
- Lava beds: travel and navigation may be difficult over lava flows.
- Aviation hazards: a map of known aviation hazards on the forest is available.
- Driving: Roads are often primitive and shared by other forest users. Defensive driving is required at all times. Caution for wildlife and in areas of poor visibility due to sun/shade and blind turns should be taken. Traffic laws are to be obeyed at all times, including en route to an incident.
- Wildfires that have the potential to affect the wildland urban interface will follow a control strategy. Firefighting personnel will be educated in additional threats associated with fires in the wildland urban interface.
- Public use: Prevention efforts will focus on high public use areas. In the event of an incident, care will be taken to inform and evacuate the public where necessary to ensure their safety.
- Smoke: Communities most likely to be affected by smoke from fires in the Mt. Adams FMU are Trout Lake Glenwood, Carson, Hemlock, Stevenson, and areas within the Columbia River Gorge Scenic Area. Larger fires occurring under East Wind conditions may affect the Portland/Vancouver metropolitan area I-84 and State Highway 14. Smoke may also affect developed and undeveloped recreation areas. Smoke impacts will be considered during daily incident evaluations.
- Weather: Mountain weather is unpredictable. Thunderstorms and instability in the atmosphere contribute to fire ignition as well as fire spread. A common thunderstorm track along the Cascades passes over the Mt. Adams FMU, often bringing lighting in June and July. Lightning holdover fires are very common in this FMU and have accounted for many of our large fires.

3.2.2.3.2 Physical Characteristics

- The Mt. Adams FMU encompasses the entire ranger district on the southeastern third of the forest. Major watersheds include the upper White Salmon, Little White Salmon and Wind River drainages. Elevations range from 1000 feet in the river bottoms to over 6000 feet or timberline on the major peaks.

3.2.2.3.3 Values at Risk

- **Value:** Carson Municipal watershed
- **Consequence:** High
- **Narrative:** Provides potable water to residents of Carson, WA. Minimal infrastructure, located within the lower Bear Creek watershed.

Municipal Watershed	LATITUDE	LONGITUDE	Township, Range, Section
Carson	45° 46' 34.2"	121° 48' 48.5"	T3N R8E sec 4

- **Value:** Historic Buildings (Cultural Resource).
- **Consequence:** High
- **Narrative:** Public Safety, These sites are listed on the National Register of Historic Places. In the event of a fire, a cultural resource advisor (i.e. district archaeologist or forest archaeologist) should be notified following the initial identification of the fire. Protection measures for these sites may include; fire wrapping of historic structures/resources, firebreaks and directional falling.
- Petersen and GMS cabins are part of the cabin rental program. Gotchen cabin is being considered for the rental program as well. Red Mt. Lookout has recently been re-constructed and may become a rental in the future. The road to the lookout is in poor condition and is very steep.

Facility	LATITUDE	LONGITUDE	Township, Range, Section
GMS Cabin	45° 52 55.5"	121° 59' 44.9"	T5N R7E sec30
Gotchen Cabin	46° 5' 20.6"	121° 29' 4.2"	T7N R11E sec18
Petersen Cabin	45° 58' 3.5"	121° 39' 37.1"	T6N R9E sec34
Red Mtn. Lookout	45° 56' 6.3"	121° 49' 16.1"	T5N R8E sec 8

- **Value:** Recreation (Campgrounds (CG), Campgrounds with Trailheads (TH), Horse Camps (HC), Picnic Sites (PG), Observation Sites (OS) and Interpretive Sites (IS) Snow Parks (SP)
- **Consequence:** High
- **Narrative:** Public Safety. All listed high values of risk due to infrastructure, public use and potential evacuation. Infrastructure will consist of some wood constructed buildings, toilets, covered picnic areas, signs and bulletin boards, and parking areas. Ingress/egress was also considered when determining the level of consequence. Public use in this area will vary depending on the time of year. Typically, the heaviest period of use would be July through October. Trigger points for protection and evacuation shall be identified.
- **Specific Sites:**

CG, TH, SP, HC	LATITUDE	LONGITUDE	Township, Range, Section
Beaver Cr. CG	45° 51' 8.5"	121° 57' 17.2"	T4N R7E s9
Cold Springs CG	46° 4' 50"	121° 45' 3.2"	T7N R8E s24
Divide TH	46° 16' 3.0"	121° 34' 39.2"	T9N R10E s16
Gotchen TH	46° 7' 8.9"	121° 30' 50.3"	T7N R10E s2
Hemlock Lake PG	45° 48' 3.4"	121° 55' 57.0 "	T4N R7E s27
Killen TH	46° 17' 11.9"	121° 33' 5.6"	T9N R10E s10
Morrison CG	46° 7' 40.5"	121° 30' 55.6"	T7N R10E s2
Moss Cr. CG	45° 47' 34.4"	121° 37' 58.6"	T4N R9E s36
Mt. Adams Horse Camp HC	46° 3' 8.8"	121° 32' 19.0"	T7N R10E s34
Muddy TH	46° 18' 23.3"	121° 32' 20.8"	T10N R10E s35
Panther Cr CG	45° 49' 6.8"	121° 52' 34.8"	T4N R7.5E s24
Paradise CG	45° 56' 50.5"	121° 56' 1.9"	T5N R7E s3
Petersen CG	45° 57' 54.0"	121° 39' 21.2"	T6N R9E s34
Potato Hill TH	46° 19' 25.9"	121° 30' 17.1"	T10N R10E s25
Riley TH	46° 13' 39.5"	121° 37' 16.4"	T9N R10E s31
Salt Creek TH	46° 6' 33.4"	121° 36' 7.7"	T7N R10E s7
Snipes Mt. TH	46° 6' 3.6"	121° 26' 0.8"	T7N R11E s9
South Climb TH	46° 8' 2.6"	121° 29' 43"	T8N R10E s36
Stagman Ridge TH	46° 8' 19.9"	121° 35' 47.9"	T8N R10E s31
Whistle Punk Trail	45° 48' 30.9"	121° 56' 30.6"	T4N R7E s28

- **Consequence:** Moderate
- **Narrative:** The sites listed below, are moderate due to limited infrastructure. Infrastructure will consist of CXT toilets, paved or unpaved parking, Forest Service signs and bulletin boards. Public use in this area will vary depending on the time of year. Typically, the heaviest period of use would be July through October.

CAMP GROUND	LATITUDE	LONGITUDE	Township, Range, Section
Atkinson SP	45° 57' 31.1"	121° 36' 51.9"	T6N R9E s36
Cultus, CG	46° 2' 44.3"	121° 45' 16.5"	T7N R8E s36
Flattop SP	46° 3' 18.8"	121° 37' 36.8"	T7N R9E s36
Forlorn Lake CG	45° 57' 25.1"	121° 45' 25.3"	T6N R8E s36
GMS Campground	45° 52' 51.7"	121° 59' 52.2"	T5N R7E s30

Goose Lake CG	45° 56' 19.7"	121° 45' 30.8"	T5N R8E s11
Koshko SP	45° 59' 45.9"	121° 54' 44.6"	T6N R7E s14
McClellan SP	46° 0' 26.4"	121° 54' 1.8"	T6N R7E s14
Oklahoma CG	45° 52' 10.4"	121° 37' 23.1"	T5N R9E s36
Old Man Pass SP	45° 59' 19.0"	121° 54' 43.5"	T6N R7E s23
Trout Lake Creek CG	46° 3' 15.0"	121° 36' 45.8"	T7N R9E s36
Wicky Shelter,	46° 5' 25.6"	121° 31' 54.5"	T7N R10E s15

- **Consequence:** Low
- **Narrative:** The sites listed below, are low due to the limited or nonexistent infrastructure. Forest Service signs and bulletin boards may exist but are limited. Public use will vary depending on time of year with the heaviest use during the summer months except for the two snow parks listed.

CAMP GROUND	LATITUDE	LONGITUDE	Township, Range, Section
All PCT entry points TH			
Crest Camp TH	45° 54' 24.9"	121° 48' 3.7"	T5N R8E s21
Falls Cr. HC	45° 57' 52.4"	121° 50' 40.9"	T6N R8E s31
Little Goose HC	46° 1' 59.2	121° 42' 49.6"	T6N R9E s5
Mosquito Lakes	46° 7' 29.0"	121° 45' 8.9"	T7N R8E s1
Mtn. View HC	46° 1' 38.3"	121° 40' 56.2"	T6N R9E s9
Pineside SP	46° 2' 48.9"	121° 29' 58.8"	T7N R10Es36
Saddle Camp CG	46° 6' 58.6"	121° 45' 44.7"	T7N R8Es2
Sleeping Beauty TH	46° 5' 0.1"	121° 39' 24.2"	T7N R9E s22
Smokey Creek CG	46° 1' 45.7"	121° 41' 17.7"	T6N R9E s4
Snow King SP	46° 3' 8.8"	121° 28' 14.8"	T7N R11Es31
South Camp CG	46° 6' 37.0"	121° 46' 1.1"	T7N R8E s11
Steamboat Lake CG	46° 7' 40.0"	121° 42' 43.9"	T7N R9E s5
Thomas Lake TH	46° 0' 14.3"	121° 50' 16.8"	T6N R8E s17
Trapper Cr. TH	45° 52' 47.3"	121° 58' 44.1"	T5N R7E s29

3.2.2.3.4 Biological

- Wildlife habitat: Where habitat exists, northern spotted owls may inhabit the Mt. Adams FMU as well as barred owls, pileated woodpeckers, goshawks, and bald eagles. Other wildlife includes blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten.
- Rivers and streams provided habitat to sensitive species of fish.
- Rare, culturally important, and special forest product botanical resources occur throughout the FMU.

3.2.2.3.5 Resources

- Timber: The timber management program provides wood products and positive economic returns. Suppression strategies will minimize the damage to the timber resource on both National Forest and adjacent lands.
- Late Successional Reserves: The late Successional reserves are designated based on their potential to provide habitat for the northern spotted owl.

Suppression strategies will aim to minimize alteration to that desired habitat designation.

- Recreation: The Mt. Adams FMU provides developed and undeveloped campsites, as well as opportunities for hunting, fishing, hiking and backpacking. Fires may inconvenience recreational users, by either displacement or visual impacts.
- Cultural resources: Resource Specialists will determine potential effects of activities on cultural resources including Native American spiritual sites and natural resources. The Resource Specialists will provide protection requirements for Historical Structures. To the extent possible, undesirable fire effects will be mitigated.
- Botanicals: The special forest products programs allows the gathering of boughs, beargrass, huckleberries, mushrooms, Christmas trees, firewood, and other botanicals. Threatened and endangered botanical species will be handled in the same way as wildlife. The adaptability or susceptibility of a particular species to fire will be specifically considered along with potential fire intensity and extent.
- Soil: Potential effects of fire to soil include the combustion of surface litter and duff layers, changes in color and chemical composition through the release of carbon, nitrogen and phosphorous in the consumption of live and dead biomass, hydrophobicity, erosion, and debris slides. Low and moderate intensity fires are unlikely to result in effects that significantly influence ecosystem composition and productivity. High severity fires increase the probability for erosion and landslide, but the predominant fire regime over most of the area is one that primarily experiences high severity fire, making these disturbance events within the natural range of variability.
- Wildlife: Northern spotted owls, barred owls, pileated woodpeckers, goshawks, and bald eagles, blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten, and many other wildlife species are found in the Mt. Adams FMU. Direct and indirect effects of fire to wildlife vary by species and the timing and intensity of the burn. They can include reduction or loss of habitat, harassment, displacement, or death from fire, smoke, and disturbance from suppression activities. The potential for sedimentation and loss of fish habitat will be addressed for all fires occurring near major waterways, particularly where the fuel loadings are outside of their natural range of variability.

3.2.2.4 FMU Fire Environment

Historical fire maps indicate several large fires in the Mt. Adams FMU during the mid- to late- 1800s and early-1900s including portions of the Yacolt, Dole Valley, Lewis River, and Willard Fires. A combination of ignition sources contributes to the variability in historical fire regimes in the area. Lightning caused fires were common, but anthropological evidence suggests that local fire regimes were highly influenced by Native Americans and sheepherders who set fires in early fall to improve the production of huckleberries and forage. Railroad companies and escaped silvicultural burns add to the number of human-caused fires. Uncontrolled fires before the era of fire suppression occurred in various landscapes, fuel loading, stages of succession, and under different weather and topographic conditions.

The introduction of fire suppression and federal protection of lands greatly decreased the size and frequency of fires. Recently, most fires occur in summer months, are lightning caused, and are low intensity with some passive crowning. Fire suppression efforts and precipitation that often accompanies summer thunderstorms have kept fires relatively small. Climatic variations dictate the average frequency of lightning storms and ignitions by influencing the potential for storms and fuel flammability. When an ignition occurs, topography, wind, fuel type, and fuel loading play an important role in the impacts of fire on the landscape.

During a typical fire season, fuels dry progressively throughout the season. Fine fuels dry in July and August while coarse fuels reach their maximum dryness in September. These fuel conditions lead to the maximum number of fires occurring in July and August but most large fires occurring in September. Historically, most large fires were human caused, east wind influenced, and in September.

Fuel Models

The 13 standard fire behavior fuel models (FBFMs) were developed to serve as inputs to Rothermel's mathematical surface fire behavior and spread model (Rothermel 1972). They represent distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types. The FBFMs are separated into grass, brush, timber litter, and a slash group. They are further broken down by loading, size class, fuel bed depth, and moisture of extinction.

A relatively large portion of the Mt. Adams FMU is classified as FBFM 10 according to LANDFIRE data. FBFM 10 has the heaviest fuel loading of the timber litter group. Most of the highly productive Douglas-fir- western hemlock forests of the Mt. Adams FMU are FBFM 10. Some of the Pacific silver fir and grand fir forests may fall into this category as well. Anderson (1982) describes it as follows:

> The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb wood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in the fuel situation, leading to potential fire control difficulties (i.e., examples insect- or disease-ridden stands, wind-thrown stands, over mature situations with deadfall, and aged light thinning or partial-cut slash).

FBFM 8 is the next most common type, occurring at high elevations, less productive sites, thinned and treated stands, and in some areas on the Mt. Adams FMU. The description is below:

> Slow-burning surface fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humilities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. (Anderson 1982)

FBFM 9 is found along some of the riparian areas. It is characterized by long-needle conifers and hardwoods. Overall, fuels dry out slower than FBFM 8 and 10. Fires run through the surface litter faster than FBFM 8 and have longer flame height but with less intensity than FBFM 10 (Anderson 1982).

Less than 5% of the land is grassy meadows (FBFM 1) and shrub-dominated lands (FBFM 5). The grass models have potential for high rates of spread but that fire behavior is extremely unlikely with the amount of annual moisture received in the study areas. These meadows typically stay green and are considered fuel breaks. In FBFM 5, areas where fires are carried by shrubs and other surface fuels, "The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material" (Anderson 1982).

Fire Regimes

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention but including the possible influence of aboriginal fire use (Agee 1993; Brown 1995; Brown and Smith 2000). The LANDFIRE models for biophysical settings used in this analysis classify fire regimes into five groups based on average fire frequency and severity indicated by percent overstory replacement. The above definitions use 25 and 75 percent as severity thresholds between the low, mixed, and replacement regimes. (FRCC Guidebook version 3.0, September 2010)

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+ years	Replacement/ any severity	Generally replacement-severity; can include any severity type in this frequency range

The majority of the Mt. Adams FMU falls within fire regime groups III and V. Lands in the western section of the FMU are fire regime group V with average fire return intervals greater than 200 years. The dry grand fir forest located in the eastern most portion of the FMU historically falls into fire regime group III with an average return interval of 25-70 years. With the insect and disease mortality in this area fires will burn with much greater intensity than they have historically.

3.2.2.4.1 Fire Behavior

While large severe fires are infrequent, serious losses, primarily to the timber resource, wildlife habitat, recreation values and aesthetics, are long term in effect. Under high and high fire danger, expected fire behavior includes high intensity, frequent flare-ups, rapid spread and running crown fires. Control is difficult. Mop-up may be expensive. Fire management efforts should minimize acreage burned in recognition of the values at risk. Fire history indicates a

workload of 19 fires per year for this FMU. Over the last decade, the FMU has experienced several fires ≥ 100 acres.

Most large fires that occur are caused by lightning storms. Timber and surface fuels are dry enough to burn in early July though intensity is low and these fires are easily suppressed. The exception is the Cold Springs fire, which grew to 8,000 acres in mid-July.

Large fires are possible in the steep inaccessible areas by late July to early August. Fires spread predictably up canyon – up slope during the day. Nighttime winds will spread fires down canyon in the lower half of the slope, sometimes with considerable acreage increases. These down canyon runs position the fire below upslope fuels setting up conditions for hard upslope runs the next burning period. In the higher elevations, fires that occur in August have the potential to burn at varying intensity levels through the remainder of the fire season. Afternoon relative humidity's can be low (teens to 20's) with gusty erratic winds. Fire spread is influenced by moderate range spotting due to the winds and low humidity's through non-continuous fuels.

Lightning activity generally occurs in July and August, with thunder cells developing along the crest of the Cascades moving from the S, SW to the N or NE. Most of the thunderstorms that occur on the west side of the crest have associated heavy rainfall; this is not always the case however and is rare on the east side of the Cascades. These storms do not necessarily cover the same area every day, but can occur somewhere on the forest for three to five days at a time. The rainfall suppresses some fires, but others can smolder undetected for several weeks following the storms. As in all parts of the forest, the most significant weather event, which has triggered large fire growth, is the presence of East winds on the western slopes of the Cascades. These winds reduce the relative humidity to the low teens or single digit numbers. Associated high winds, dry fuels and steep forested areas create large fire growth conditions. Conversely, large fire growth on the east side of the Cascade crest is associated with strong westerly winds. These winds are created by frontal passages coming from the west or by strong down drafts from thunderstorm activity. Thermal troughs are also a major catalyst for large fire growth as experienced on the 2008 8,000-acre Cold Springs fire. There is a 70% probability of a season ending event by October 2. Daytime temperatures become cooler and nighttime temperatures are chilly.

The general fire season for the forest is roughly 100 days, beginning in July and ending in mid to late October. Due to the high elevation areas, the season is approximately a month later than the low elevation areas of the forest. This is dependent upon typical winter snowfall and spring snowmelt, which can change rapidly.

Fire exclusion has created stand structures in some places with ladder fuels that will contribute significantly to spotting and crowning potential.

3.2.2.4.2 Weather

Fuel moistures peak in late May to early June, which is dependent upon the ending of the seasonal rains. As the Pacific storm track (jet stream) into western Washington becomes less frequent, precipitation in the Mt. Adams FMU begins to diminish. This, combined with longer daylight hours starts the drying trend that leads to fire season. Mild, wet winters and hot dry summers typify the climate of the Cowlitz Valley FMU. Average annual precipitation is near 100 inches on the west side of the FMU and approximately 40 inches on the east side, much of this occurring in the form of snow. Fine fuels reach their maximum dryness in July and August, while the larger fuels do not usually dry out until September. As a result, the highest number of fires in any given year occurs during July and August (roughly 65%), and September (20%). Most of these are less than ten acres in size, but the last decade indicates a greater percentage of fires are reaching 50 acres or more on the east side. Most of the large fires and virtually all of the severe fires occur during September or from late August to early October. Consequently, the average peak for fire frequency occurs prior to the average peak for fire size.

Two weather patterns have the greatest effect on fire behavior or resistance to control on the forest, the thermal trough and marine push. These patterns may occur independently of one another or in succession as the thermal trough passes to the east of the Cascades a marine push may move in behind the trough. The effects of which are different on each side of the Cascades.

The thermal trough creates what are regionally referred to as east wind events. The thermal trough will build along the coast creating an area of low pressure. As a result, winds originating in Eastern Oregon/Washington will develop as east winds bringing warm dry air to the west side of the Cascades. This wind will increase in speed through saddles and gaps and accelerate downhill as well; though some areas may be sheltered from the east wind. However, all areas west of the Cascades will experience very low minimum RH with little recovery overnight. This enables wind driven spread in areas directly impinged by east winds, terrain driven spread in areas sheltered from the wind, and active burning through the night. Thermal troughs associated with high Haines days or atmospheric instability create a very high potential for large fire growth near the crest. September and October are months during the fire season this most frequently occurs.

In early July of 2008 Cold Springs Fire, when periods of critically dry and unstable air mass develops over the Cascades, along with a Haines index of six created an explosive fire event which burned nearly eight thousand acres of forest lands. Prior to the Cold Springs fire, the largest and most severe fires on the GPNF have all been associated with east winds (Yacolt, Siouxon, Lewis River, Cispus, Dole, Willard, Ruth). All of these large fires with the exception of Cispus were on the south half of the forest where the east winds are most severe. All of the large fires were preceded by several weeks of extremely hot and dry weather and all but the Willard fire occurred during the month of September.

A marine push may occur as the thermal trough moves off to the east, but a marine push may also occur independently of the thermal trough. The

moderate/strong marine push brings moist air to the west side of the Cascades but also creates a west winds and instability on the east side of the Cascades. A Foehn effect may also occur as the Cascades form a barrier to moisture moving westward and causing warm dry air to rush down the east slope of the Cascades.

When a thermal trough is forecasted for the area, expect strong easterly winds, very low minimum RH, and little recovery and active fire spread through the night. This pattern may persist for several days. When a moderate or strong marine push is forecasted, the east slope of the Cascades should expect gusty westerly winds, instability with development of thunderstorms, and warm, dry, and gusty downhill winds from the crest of the Cascades. In both cases, expect the potential for wind that accelerates through the gaps and gorge.

The primary ignition source on the forest continues to be from lightning. Human caused fires continue to increase however as more areas adjacent to the forest are being developed and as visitor use patterns change. Although lightning is less common on the west side of the Cascades than the east side, it still accounts for a large percent of the fire starts (ranging from 35-70%). During the summer season, cells develop and move north along the Cascade Range. These cells are often associated with rain showers as well as dry lightning. The Pacific high dominates summertime weather causing hot temperatures (75-90+ degrees), dry humidity's (30-40%, frequently lower), and low 10-hour fuel moistures (3-5%). Summer rainfall is non-existent except for precipitation from passing thunderstorms, which mainly falls at higher elevations. Fall rains generally return in mid to late October.

The ending of fire season is more variable than the start. Although dwindling sunlight provides less surface heating, season ending moisture is dependent on Pacific storm systems. The location of the jet stream plays a major role in determining the path of the storms. Historically the fire season has ended in October.

3.2.2.4.3 Fire History

Wildfire: Crofton	**Wilderness:** Mt. Adams	**Acres:** 93
Incident Complexity: Type 3	**Cause:** Lighting	**Fuel Model:** G
Control: 9/13/2009	**Out:** 10/15/2009	**Cost:** 508,360
Ignition Date: 9/3/2009	**Discovery Date:** 9/3/2009	**ERC:** 42
BI: 36	**1000 FM: 15**	
Narrative: The fire was ignited by a lightning storm on 9/3/2009 and was discovered the same day by a Trout Lake resident. It was one acre in size when resources arrived. The application of retardant allowed IA resources to construct line around the fire and it was left for the next day. Two snags fell across the line during the night and fire spread rapidly until 3+ inches of rain fell on 9/5/2009. Fire spread was from tree to tree with little surface spread.		
Wildfire: McDonald	**LSR:** Mt. Adams	**Acres:** 110
Incident Complexity: Type 3	**Cause:** Lighting	**Fuel Model:** G
Control: 8/21/2004	**Out:** 9/18/2004	**Cost:** 595,000

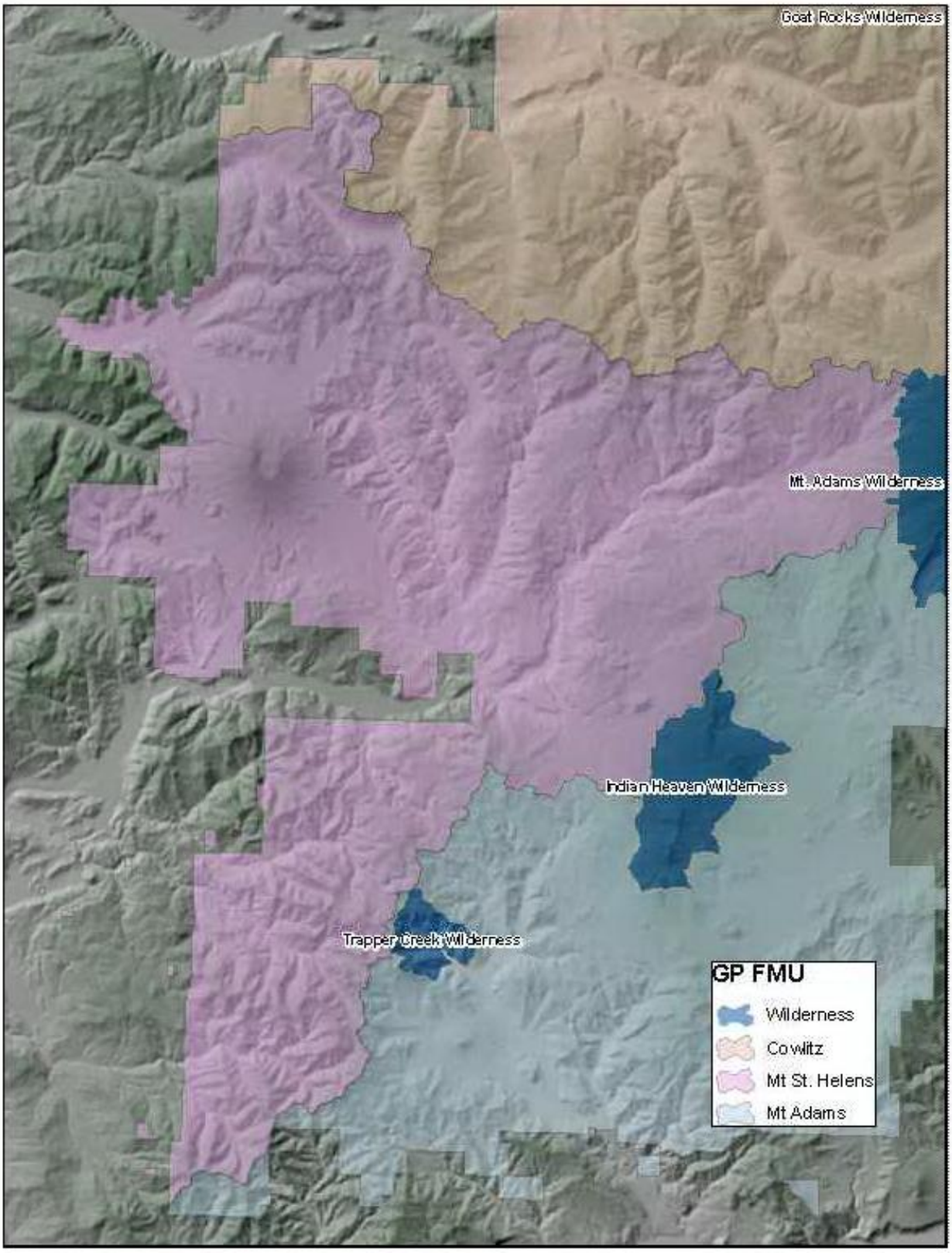
Ignition Date: 8/4/2004	**Discovery Date:** 8/4/3004	**ERC:** 34
BI: 32	**1000 FM: 16**	
Narrative: The fire was ignited by a lightning storm on 8/4/2004. Several fires were started from this storm but they were controlled under 10 acres.		
Salt Cr.	**Wilderness: Mt. Adams**	**Acres: 316**
Incident Complexity: Type 2	**Cause:** Lighting	**Fuel Model:** G
Control: 9/26/2001	**Out:** 10/22/2001	**Cost:** 2,300,000
Ignition Date: 9/15/2001	**Discovery Date:** 9/15/2001	**ERC:** 27
BI: 37	**1000 FM: 19**	
Narrative: The fire was ignited by a lightning storm on 9/15/2001 and was discovered the same day. Above average precipitation fell in both July and August in 2001 but late August and early September were dry and warm. Access to this fire was very difficult and the majority of resources were spiked out in meadows near the fire. The fire also had multiple spots which made mop up difficult and long.		
Wildfire: Cold Springs	**LSR:** Mt. Adams	**Acres:** 7,980
Incident Complexity: Type 2	**Cause:** Lighting	**Fuel Model:** G
Control: 8/6/2008	**Out:** 12/22/2008	**Cost:** $10,000,000.
Ignition Date: 6/29/2008	**Discovery Date:** 7/11/2008	**ERC:** 55
BI: 61	**1000 FM: 13%**	
Narrative: The fire was ignited by a lightning storm on 6/29/2008 and was discovered two weeks later. Aerial detection was flown for days after the storm but it was not until the thermal low set up over the area that the fire flared up. Heavy fuel loading and record ERC values for the date also contributed to large fire growth. It was one acre in size when resources arrived but quickly picked up as temperatures and atmospheric instability rose early in the day. Several loads of retardant were used to establish a firebreak to allow the evacuation of several hikers and their vehicles from the South Climb trailhead down the 8040 road. Fire burned on tribal, state and private lands as well as Forest Service.		

3.2.3. Fire Management Considerations for Specific Fire Management Units

3.2.3.1 Mount St Helens FMU Snap Shot

- **FMU Name:** Mount St Helens
- **Fire Behavior Indicator:** Energy Release Component (ERC)
- **NFDRS Weather Station:** Canyon Creek RAWS – NWSID 451921
- **Acres/Agency:** 462,400
- **Predominant Vegetation Types:** National Fire Danger Rating System fuel model G represents the fuel conditions within this FMU. The primary fuel model is represented by dense stands of mature Douglas fir with heavy accumulations of ground litter and large woody materials.
- **IA Dispatch Office:** Columbia Cascade Communication Center
- **LRMP options available for management response:** Fire suppression strategies depend upon specific Management Area standards and guidelines, alternative suppression strategies to consider include confine, contain and control. Section 3.1.1. Gifford Pinchot Land and Resource Management Plan and Table 3.1 of this document, summarizes management response suppression strategies for specific Management Areas.

Figure 3.3 Mount St. Helens FMU



3.2.3.2 FMU Guidance

- **Desired Conditions, Objectives, Guidelines, Goals and Standards**: Section 3.1.1. Gifford Pinchot Land and Resource Management Plan *and FMU* Guidance and Table 3.1 provides a summary of guidance for this FMU.

3.2.3.3 FMU Characteristics

3.2.3.3.1 Safety

Firefighter and public safety is the primary concern. Limited accessibility, steep terrain, and areas of heavy timber can challenge the efficacy and safety of suppression efforts. Where these concerns arise, suppression tactics that minimize threats to firefighter and safety will be employed.

- Fire fighter and public safety will remain the utmost priority. Terrain, accessibility, and potential fire behavior will influence fire management decisions.
- Accessibility: Unroaded land allocations or poor road conditions may limit accessibility. Ingress and egress will be clearly marked and addressed in pre-engagement safety briefings.
- Lava beds: travel and navigation may be difficult over lava flows.
- Aviation hazards: a map of known aviation hazards on the forest is available.
- Driving: Roads are often primitive and shared by other forest users. Defensive driving is required at all times. Caution should also be taken for wildlife and in areas of poor visibility due to sun/shade and blind turns. Traffic laws are to be obeyed at all times, including en route to an incident.
- Wildland urban interface: The Forest Service will cooperate with local communities to implement Community Wildfire Protection Plans and develop defensible space. Wildfires that have the potential to affect the wildland urban interface will follow a control strategy. Firefighting personnel will be educated in additional threats associated with fires in the wildland urban interface.
- Public use: Prevention efforts will focus on high public use areas. In the event of an incident, care will be taken to inform and evacuate the public where necessary to ensure their safety.
- Smoke: Communities most likely to affected by smoke from fires within the Mount St. Helens FMU are Cougar, Swift, Northwoods, Amboy and Ariel. Larger fires occurring under East Wind conditions may affect the Portland-Vancouver Metropolitan area as well the I-5 corridor including all cities and towns located between Longview,WA and Portland, OR. Smoke may also affect developed and undeveloped recreation areas. Air quality and smoke management protocols per the Washington Department of Natural Resources will be followed where required. Smoke impacts will be considered during daily incident evaluations.
- Weather: Mountain weather is unpredictable. Thunderstorms and instability in the atmosphere contribute to fire ignition as well as fire spread. A common thunderstorm track along the Cascades passes over the Mount St. Helens FMU, often bringing lighting in June and July. The Mount St. Helens FMU is

influenced by the Foehn Wind known as the East Winds, caused by pressure gradients across the Cascades. Spot weather forecasts will be requested for all fires requiring extended attack and as appropriate during times of high potential fire behavior.

- Fuels: A wide variety of fuel conditions exist in the Mount St. Helens FMU. There are concentrations of down woody debris but large fire potential is often moderated due to higher fuel moisture levels. Down woody debris makes travel difficult and contributes to fire severity and spread. Dense regenerating stands can pose a problem to control where they occur throughout the FMU.

3.2.3.3.2 Physical Characteristics

- The major drainages in the Mount St. Helens FMU include the Lewis River, East Fork of the Lewis River, Muddy, Pine, Clear, and Canyon Creek drainages. Elevation ranges from near sea level up around 4,500 feet. Slope ranges from near level to steep and rugged.

3.2.3.3.2.1 Values at Risk

- **Value:** Recreation (Visitor Centers (VC), Campgrounds (CG), Trailheads (TH), Horse Camps (HC), Picnic Sites (PG), Observation Sites (OS) , Snow Parks (SP) and Interpretive Sites (IS))
- **Consequence:** High
- **Narrative:** Public Safety. All listed high values of risk due to infrastructure, public use and potential evacuation. Infrastructure will consist of some wood constructed buildings, toilets, covered picnic areas, signs and bulletin boards, and parking areas. Public use in this area will vary depending on the time of year. Typically, the heaviest period of use would be July through October. Trigger points for protection and evacuation shall be identified.
-
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
Ape Cave (IS)	46°6'29.231"N	122°12'45.328"W	
Canyon Creek (CG)	45°54'59.803"N	122°12'14.428"W	
Cascade Peaks VC (vendor)	46°16'56.03"N	122°4'54.589"W	
Climbers Bivouac	46°8'48.262"N	122°10'57.072"W	
Coldwater (VC)	46°18'12.194"N	122°15'52.604"W	
Coldwater Lake (PG)	46°17'25.69"N	122°16'5.563"W	
Green River (HC, TH)	46°20'56.803"N	122°5'2.679"W	
Johnston Ridge (VC)	46°16'37.48"N	122°12'56.448"W	
Kalama (HC)	46°8'35.599"N	122°19'35.217"W	
Lewis River HC	46°11'7.884"N	121°51'7.18"W	
Lower Falls (CG, TH)	46°9'25.417"N	121°52'47.518"W	
Pine Creek Work Center	46°3'43.825"N	122°1'56.237"W	
Sunset (CG)	45°49'7.683"N	122°15'8.117"W	
Trail of Two Forests (TH,PG)	46°5'54.326"N	122°12'49.516"W	
Windy Ridge (IS)	46°14'57.853"N	122°8'14.222"W	

- **Value:** Recreation (CG, TH, HC, PG, OS, IS)
- **Consequence:** Moderate
- **Narrative:** The sites listed below, are moderate due to limited infrastructure. Infrastructure will consist of CXT toilets, paved or unpaved parking, Forest Service signs and bulletin boards. Public use in this area will vary depending on the time of year. Typically, the heaviest period of use would be July through October.
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
83 Monument Entry (IS)	46°5'28.798"N	122°12'35.504"W	
Ape Canyon (TH, PG)	46°9'56.125"N	122°5'34.299"W	
Bear Meadows (TH, PG)	46°18'46.6"N	122°2'14.992"W	
Big Creek Falls (TH)	46°6'8.826"N	121°54'24.909"W	
Cedar Creek (OS)	46°16'19.927"N	122°6'36.852"W	
Cedar Flats (TH)	46°6'42.05"N	122°1'3.592"W	
Clearwater (OS)	46°14'16.227"N	121°59'4.586"W	
Cougar (SP)	46°7'1.948"N	122°12'20.612"W	
Curly Creek Falls (TH, PG)	46°3'41.615"N	121°58'26.734"W	
Harmony (TH, IS)	46°16'29.976"N	122°6'14.035"W	
June Lake (TH)	46°8'13.579"N	122°9'26.871"W	
Lava Canyon (TH, PG)	46°9'57.749"N	122°5'15.764"W	
Lone Butte (SP)	46°2'37.485"N	121°51'36.277"W	
Marble Mt (SP)	46°7'49.443"N	122°10'16.115"W	
McCellen (OS)	46°2'25.009"N	121°55'7.364"W	
Middle Falls (TH)	46°9'59.591"N	121°52'7.761"W	
Muddy River (PG)	46°7'26.099"N	122°0'52.178"W	
Norway Pass (TH)	46°18'18.028"N	122°4'57.348"W	
Quartz Creek (TH)	46°10'59.098"N	121°50'52.008"W	
Siouxson (TH)	45°56'47.873"N	122°10'38.615"W	
Smith Creek (PG, OS)	46°15'8.756"N	122°7'5.073"W	
Tillicum (CG)	46°7'29.16"N	121°46'43.694"W	
Twin Falls (CG)	46°12'58.757"N	121°40'6.646"W	
Upper Smith Creek (TH)	46°15'30.321"N	122°6'56.617"W	

- **Value:** Recreation (CG, TH, HC, PG, OS, IS, SP)
- **Consequence:** Low
- **Narrative:** The sites listed below, are low due to the limited or nonexistent infrastructure. Forest Service signs or bulletin boards may exist but are limited. Public use will vary depending on time of year with the heaviest use during the summer months.
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
Berryfield Access (PG)	46°5'4.077"N	121°46'59.716"W	
Blue Horse (TH)			
Blue Lake (TH)	46°8'32.065"N	122°16'3.152"W	
Bluff Mt. (TH)	45°46'50.084"N	122°10'2.501"W	
Craggy Peak (TH)			
East Fork (TH)			
Goat Mt. (TH)			
Hummock/Boundary (TH)	46°17'13.883"N	122°16'18.077"W	
Independence Pass (TH)	46°16'52.973"N	122°5'45.516"W	
Lahar (IS)	46°9'34.013"N	122°5'44.625"W	
McBride (TH)			
Meta Lake (TH)	46°17'46.199"N	122°4'41.304"W	
Miners Car (IS)	46°17'48.866"N	122°4'35.834"W	
Outlaw Ridge	46°2'23.502"N	121°54'2.378"W	
Placid Lake (TH)	46°2'55.282"N	121°48'37.439"W	
Red Rock Pass (TH)	46°8'39.494"N	122°14'6.34"W	
Sheep Canyon (TH)	46°12'9.136"N	122°16'10.126"W	
Silver Star (TH)	45°46'20.291"N	122°14'38.344"W	
Smith Creek #8322 (TH)	46°10'59.444"N	122°3'17.723"W	
Soda Peaks (TH)	45°53'26.353"N	122°3'54.784"W	
Speed (TH)	46°6'8.826"N	121°54'24.909"W	
Spencer Butte (TH)	46°8'24.862"N	121°56'22.936"W	
Spencer Meadow (TH)			
Starway (TH)			
Thomas Lake (TH)	46°0'23.21"N	121°50'25.061"W	
Williams Mine (TH)	46°10'16.489"N	121°37'44.185"W	
Wright Meadow North (TH)			
Wright Meadow South (TH)	46°9'58.002"N	121°52'26.303"W	

- **Value:** Recreation , Hiking Shelters
- **Consequence:** High
- **Narrative:** Frequently visited by the public. These sites have high intrinsic value, high historical value, and a moderate to high replacement value.
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
Bolt Camp Shelter	46°04'47"N	121°55'46.14"W	T7N R7E Sec. 21
House Rock Shelter	46°04'49.36"N	121°57'55.40"W	T7N R7E Sec. 20
Kum Back Shelter	46°05'53.3"N	121°54'05.14"W	T7N R7E Sec. 14
Pine Creek Shelter	46°09'24.03"N	122°06'56.43"W	T8N R6E Sec. 19

- **Value:** Infrastructure, USDA-National Resource Conservation Service-National Water and Climate Center Snotel Sites
- **Consequence:** High
- **Narrative:** Nine individual sites. Moderate to High replacement value. Each site houses sensitive equipment that could be damaged by wildfire. Any loss due to wildfire could impact NRCS's ability to collect meteorological data.
- **Specific Sites:**

Site	**LATITUDE**	**LONGITUDE**	**Township, Range, Section**
Calamity			T5N R5E Sec. 20
June Lake	46°4'48"N	122°5'24"W	T8N R5E Sec. 26
Lone Pine	46°19'36"N	121°34'48"W	T9N R7E Sec. 8
Pepper Creek			T7N R7E Sec. 9
Sheep Canyon	46°6'36"N	122°9'W	T8N R4E Sec. 12
Spencer Meadows	46°6'36"N	121°33'36"W	T8N R7E Sec. 15
Spirit Lake	46°9'36"N	122°6'36"W	T9N R5E Sec. 15
Surprise Lakes	46°3'36"N	122°6'36"W	T7N R8E Sec. 14
Swift Creek	46°9'36"N	122°27'W	T8N R5E Sec. 22

- **Value:** Infrastructure, USGS Stream Gauging Stations
- **Consequence:** High
- **Narrative:** Seven individual sites. Gauging stations house sensitive equipment with high replacement values. Any loss due to wildfire could impact USGS's ability to forecast stream flows and issue timely warnings associated with lahars from Mount St. Helens.
- **Specific Sites:**

Site	**LATITUDE**	**LONGITUDE**	**Township, Range, Section**
Spirit Lake Tunnel			T9N R5E Sec. 10
Loowit Channel			T9N R5E Sec. 33
Castle Lake Blockage			T9N R4E Sec. 14
Castle Lake East			T9N R4E Sec. 14
Castle Lake West			T9N R4E Sec. 14
Coldwater Lake			T9N R4E Sec. 14
Lewis River			T9N R4E Sec. 2

- **Value:** Infrastructure, Plate Boundary Observatory Sites
- **Consequence:** High
- **Narrative:** Plate Boundary Observatory sites house sensitive monitoring equipment to monitor plate tectonics. Each site also contains a 500 gallon propane tank. Any loss of equipment from wildfire would inhibit PBO's ability to monitor plate tectonics and impede their ability to recognize and forecast seismic activity. High replacement cost.
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
East Dome	46°11'56.35"N	122°9'51.17"W	
Loowit	46°13'28.27"N	122°11'3.23"W	
Nelson Ridge	46°11'48.77"N	122°9'5.89"W	
Northwest Dome	46°12'37.16"N	122°12'8.45"W	
South Ridge A	46°10'48.2"N	122°11'23.4"W	
Southeast Ridge	46°11'15.51"N	122°10'35.79"W	
Southeast Slope	46°10'24.48"N	122°9'38.2"W	
West Radial	46°11'.23.4"N	122°12'11.52"W	

- **Value:** Infastructure, Remote Automated Weather Stations
- **Consequence:** High
- **Narrative:** Potential loss of valuable real time weather data for fire weather forecasting. Moderate replacement cost.
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
Canyon Creek RAWS	45°55'45.84"N	122°12'10.08"W	

- **Value:** Infastructure, Radio Repeater Sites (R), Cell towers (C)
- **Consequence:** High
- **Narrative:** Site houses USFS and WADNR radio equipment and a Verizon cell tower. Losses due to wildfire would have a significant impact on the local infrastructure of several small communities and Forest Service facilities including: the towns of Cougar and Ariel, the community of Northwoods, Ape Cave and Pine Creek Work Center. Forest Service and WADNR communications could be significantly disrupted. Replacement value is high.
- **Specific Sites:**

Site	LATITUDE	LONGITUDE	Township, Range, Section
Coldwater	46°17'59.327"N	122°11'2.034"W	
Mitchell Peak	46°1'52.639"N	122°11'33.246"W	
Pt. 3670	46°02'17.86"N	122°01'06.49"W	

- **Value:** Northwoods Community (W.U.I)
- **Consequence:** High
- **Narrative:** This community is located at the east end Swift Reservoir. It is covered by Skamania Fire District 26. There will be increased complexity due to a multiple jurisdictional incident and potential evacuation. It consists of numerous separate structures with limited egress and ingress. Multiple year round residence and vacation homes. There is no Community Fire Protection Plan.

Value	LATITUDE	LONGITUDE	Township, Range, Section
Northwoods	46°03'37.45"N	122°01'06.49"W	T7N R6E Sec. 25 & 26

3.2.3.3.3 Biological

- Wildlife habitat: Where habitat exists, northern spotted owls may inhabit the Mount St. Helens FMU as well as barred owls, pileated woodpeckers, goshawks, and bald eagles. Other wildlife include blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten.
- Rivers and streams provided habitat to sensitive fishes.
- Rare, culturally important, and special forest product botanical resources are found in the FMU.

3.2.3.3.4 Resources

- Mount St. Helens FMU has private communities of Swift and Northwoods which are surrounded by National Forest Land.
- Mount St. Helens National Volcanic Monument is a Congressionally Designated Area. The 1980 volcanic eruption resulted in a nuclear type blow down event, leaving the blast zone with heavy accumulations of down woody debris, with little to no fine fuel or brush component.
- Timber: The timber management program provides wood products and positive economic returns. Suppression strategies will minimize the damage to the timber resource on both National Forest and adjacent lands.
- Late Successional Reserves: The late successional reserves are designated based on their potential to provide habitat for the northern spotted owl. Suppression strategies will aim to minimize alternation to that desired habitat designation.
- Recreation: The Mount St. Helens FMU provides developed and undeveloped campsites, as well as opportunities for hunting, fishing, hiking and backpacking. Fires may inconvenience recreational users by either displacement or visual impacts.
- Cultural resources: Resource specialists will determine potential effects of activities on cultural resources including Native American spiritual sites and natural resources. Fire effects will be mitigated as much as possible. Historic structures including Gotchen Guard Station, Peterson Prairie Guard Station, and Red Mountain Lookout will be protected.

- Botanicals: The special forest products programs allows the gathering of boughs, beargrass, huckleberries, mushrooms, Christmas trees, firewood, and other botanicals. Threatened and endangered botanical species will be handled in the same way as wildlife. The adaptability or susceptibility of a particular species to fire will be specifically considered along with potential fire intensity and extent.
- Soil: Potential effects of fire to soil include the combustion of surface litter and duff layers, changes in color and chemical composition through the release of carbon, nitrogen and phosphorous in the consumption of live and dead biomass, hydrophobicity, erosion, and debris slides. Low and moderate intensity fires are unlikely to result in effects that significantly influence ecosystem composition and productivity. High severity fires increase the probability for erosion and landslide, but the predominant fire regime over most of the area is one that primarily experiences high severity fire, making these disturbance events within the natural range of variability.
- Wildlife: Northern spotted owls, barred owls, pileated woodpeckers, goshawks, and bald eagles, blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten, and many other wildlife species are found in the Mount St. Helens FMU. Direct and indirect effects of fire to wildlife vary by species and the timing and intensity of the burn. They can include reduction or loss of habitat, harassment, displacement, or death from fire, smoke, and disturbance from suppression activities. The potential for sedimentation and loss of fish habitat will be addressed for all fires occurring near major waterways, particularly where the fuel loadings are outside of their natural range of variability.

3.2.3.4 FMU Fire Environment

Historical fire maps indicate several large fires in the Mount St. Helens FMU during the mid- to late- 1800s and early-1900s including portions of the Yacolt, Dole Valley, Lewis River, and Willard Fires. More recently in the 1970's and 80's nine fires grew larger than 100 acres, all of which were either caused by logging equipment or escaped slash burns. A combination of ignition sources contributes to the variability in historical fire regimes in the area. Lightning caused fires were common, but anthropological evidence suggests that local fire regimes were highly influenced by Native Americans who set fires in early fall to improve the production of huckleberries and forage. Railroad companies and escaped silvicultural burns add to the number of human-caused fires. Uncontrolled fires before the era of fire suppression occurred in various landscapes, fuel loading, stages of succession, and under different weather and topographic conditions.

The introduction of fire suppression and federal protection of lands greatly decreased the size and frequency of fires. Recently, most fires occur in summer months, are lightning caused, and are low intensity with some passive crowning. Fire suppression efforts and precipitation that often accompanies summer thunderstorms have kept fires relatively small. Climatic variations dictate the average frequency of lightning storms and ignitions by influencing the potential for storms and fuel flammability. When an ignition occurs, topography, wind, fuel type, and fuel loading play an important role in the impacts of fire on the landscape.

During a typical fire season, fuels dry progressively throughout the season. Fine fuels dry in July and August while coarse fuels reach their maximum dryness in September. These fuel conditions lead to the maximum number of fires occurring in July and August but most large fires occur in September. Historically, most large fires were human caused, east wind influenced, and in September and early October.

Fuel Models

The 13 standard fire behavior fuel models (FBFMs) were developed to serve as inputs to Rothermel's mathematical surface fire behavior and spread model (Rothermel 1972). They represent distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types. The FBFMs are separated into grass, brush, timber litter, or slash groups and then broken down further by loading by size class, fuel bed depth, and moisture of extinction.

A relatively large portion of the Mount St. Helens FMU is classified as FBFM 10 according to LANDFIRE data. FBFM 10 has the heaviest fuel loading of the timber litter group. Most of the highly productive Douglas-fir- western hemlock forests of the Mount St. Helens FMU are FBFM 10. Some of the Pacific silver fir, Lodgepole and Mountain Hemlock forests may fall into this category as well. Anderson (1982) describes it as follows:

> The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in the fuel situation, leading to potential fire control difficulties…examples are insect- or disease-ridden stands, wind-thrown stands, over mature situations with deadfall, and aged light thinning or partial-cut slash.

FBFM 8 is the next most common type, occurring at high elevations, less productive sites, thinned and treated stands, and in some areas on the eastern portion of the Mount St. Helens FMU. It is described here:

> Slow-burning surface fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. (Anderson 1982)

FBFM 9 is found along some of the riparian areas. It is characterized by long-needle conifers and hardwoods. Overall, fuels dry out slower than FBFM 8 and 10. Fires run through the surface litter faster than FBFM 8 and have longer flame height but with less intensity than FBFM 10 (Anderson 1982).

Less than 5% of the land is grassy meadows (FBFM 1) and shrub-dominated lands (FBFM 5). The grass models have potential for high rates of spread but that fire behavior is extremely unlikely with the amount of annual moisture received in the study areas. These meadows typically stay green and are considered fuel breaks. In FBFM 5, areas where fires are carried by shrubs and other surface fuels, "The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material" (Anderson 1982).

Fire Regimes

Fire regimes are broken down based on the historical role of fire across a certain landscape without the influence of modern human intervention but including the influence of aboriginal fire use (Agee 1993; Brown 1995). The LANDFIRE models for biophysical settings used in this analysis classify fire regimes into five groups based on average fire frequency and severity indicated by percent overstory replacement. The following fire regime definitions use 25 and 75 percent as severity thresholds between low, mixed, and replacement regimes (FRCC Guidebook Version 1.3.0).

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+ years	Replacement/ any severity	Generally replacement-severity; can include any severity type in this frequency range

The Mount St. Helens FMU has fire regime groups III and V. Lands in the western section of the FMU are fire regime group V with average fire return intervals greater than 200 years. Much of the area including the lower elevations near drainage bottoms are fire regime V, with Fire Regime III occurring across much of the upper slopes in the lodgepole and mountain hemlock stands.

3.2.3.4.1 Fire Behavior

The Mount St Helens National Volcanic Monument has a light fire load, averaging five fires per year. Between the years of 1985 and 2009, approximately 90% of all fires burned between July 1st and September 30th. Typical fire behavior observed is creeping and smoldering with low rates of spread and flame lengths. There are two natural fuel models that typify the fuel characteristics of the forested areas throughout the Monument. These are the Timber Litter-5 and Timber Litter-7 from the 2005 Scott/Burgan Fuel Models.

3.2.3.4.2 Weather

Weather data from the Western Regional Climate Center from 1971-2000 shows average maximum temperatures of around 78 degrees Fahrenheit for June and September and 92 degrees for July and August. Average minimums were around 24 degrees in December and January. Average mean annual precipitation is 43.4 inches with less than an inch in each July and August and 1.0-1.5 inches in each June and September. The majority of precipitation falls from November through February in both of the aforementioned areas. Precipitation becomes increasingly higher to the west, up to averages exceeding 100 inches of annual precipitation.

Wind speeds and direction vary, but typical prevailing winds are from the south. Historically, fall east wind events have been known to cause drying and

significantly influence fire behavior and spread. From 1999-2009 in the July 1-September 30 timeframe, some component of an east wind (SE, NE) was present 20% of the time at up to 7.5 miles per hour. A straight east wind was observed 5.4% of the time at 7.4 miles per hour.

Fire season begins June 15th when seasonal rains begin to diminish. Both wet and dry thunderstorms are common in June and July. In a typical fire season, very little precipitation falls during July and the first part of August. A weather event bringing precipitation often occurs in mid-late August, but rarely does this event end the season. Fuels quickly dry out again and ERC's rise throughout September when fuels are at their driest and east winds are common. Observations from the Canyon Creek RAWS:

Canyon Creek Station	50th Percentile	97th Percentile	Highest Recorded
ERC	23	47	64
1Hr Fuel Moisture (%)	11.21	3.18	3.37
100 Hr FM (%)	17.15	8.93	7.02

A season-ending precipitation event typically occurs between late September and mid-October.

3.2.3.4.3 Fire History

Wildfire: Straight Creek	**Discovery:** 8/17/2009 at1800 hours	**Acres:** 15
Incident Complexity: T- 3	**Cause:** Human not specific	**Fuel Model:** G
Contained: 8/21/2010	**Out:** 9/17/2010	**Cost:** $385,000
Narrative: A human caused fire started on 8/17/2010 and discovered by Forest Service Law Enforcement at 1800. This fire burned in pre-commercial thinning slash and an old growth Douglas fir stand. The size of the fire although not impressive represents the largest fire in this FMU since 1987. This fire burned under the lingering effects of a thermal trough which resulted in unusually warm and dry conditions. Confinement was not abnormally difficult, but like most fires within this FMU mop up presented the greatest challenge for firefighters with a heavy duff layer and large diameter service fuels. The majority of the financial costs were absorbed during the mop up phase, while utilizing a strike team of engines supported by 2 water tenders and 3 type 2 crews.		

3.2.4 – D. Fire Management Considerations for Specific Fire Management Units

3.2.4.1 Wilderness FMU Snap Shot

- **FMU Name:** Wilderness
- **Fire Behavior Indicator:** Energy Release Component (ERC)
- **NFDRS Weather Station:**
  - Mt. Adams Wilderness (south)–
    - Trout Creek RAWS - NWSID 451917
  - Mt. Adams Wilderness (north)-
    - Orr Creek RAWS- NWSID 451919
  - Goat Rocks Wilderness
    - Hagar Creek RAWS- NWSID 451115
  - Tatoosh Wilderness
    - Hagar Creek RAWS- NWSID 451115
  - William O. Douglas Wilderness
    - Hagar Creek RAWS- NWSID 451115
  - Indian Heaven Wilderness-
    - Dry Creek RAWS -NWSID 451924
  - Trapper Creek Wilderness
    - Dry Creek RAWS -NWSID 451924
  - Glacier View Wilderness
    - Hagar Creek RAWS- NWSID 451115
- **Acres/Agency:** 180,600 acres USDA Forest Service
  - Mt. Adams Wilderness- 47,270 acres
  - Goat Rocks Wilderness- 71,670 acres Cowlitz Valley Ranger District; 105,600 total acres
  - Tatoosh Wilderness- 15,700 acres
  - William O. Douglas Wilderness- 15,880 acres Cowlitz Valley Ranger District; 166,000 total acres
  - Indian Heaven Wilderness- 20,600 acres
  - Trapper Creek Wilderness-6,050 acres
  - Glacier View Wilderness- 3,000 acres
- **Predominant Vegetation Types and Disturbance Regimes:**

  A crosswalk was developed locally from the regional plant association group map to biophysical settings (BpS's). Similar to potential natural vegetation groups, biophysical settings represent "vegetation that may have been dominant on the landscape prior to Euro-American settlement and is based on both the current biophysical environment and an approximation of the historical disturbance regime" (LANDFIRE). A description of the biophysical settings found in the wildernesses of the Gifford Pinchot National forest in order of decreasing abundance follows.

- **North Pacific Mountain Hemlock Forest- Wet**

  The most frequently occurring BpS in the wildernesses of the Gifford Pinchot National Forest, the wet mountain hemlock BpS occurs sporadically in the high elevation forested zones. The lower elevation limit of the type ranges from about 3,500 feet in the west Cascades to 3,000 feet on the east side of the Cascades. Sites are cold and characterized by deep (10-20 feet), persistent snowpack and short growing season. The late seral stands are co-dominated by mountain hemlock (*Tsuga mertensiana)* and Pacific silver fir (*Abies amabilis)*. Along the elevation gradient, this mountain hemlock type is above the mesic-wet Pacific silver fir type, and below subalpine parkland. Most fires occur as single tree lightning strikes, particularly on ridgelines, so the frequency of fire tends to be low. Estimates for fire return intervals are over 1000 years, but lack of evidence makes it difficult to determine. In areas of continuous forest, fire sizes can range from tens to hundreds of acres. Avalanches may be a more common disturbance than fire and they tend to repeat at the same locations. Heart-rots and butt-rots occur, but not at a stand scale. Late-successional stands with large individuals (>20 inches in diameter) of mountain hemlock dominate the stands with advanced regeneration of mountain hemlock and other shade tolerant species.

- **North Pacific Mountain Hemlock Forest- Xeric**

  The xeric mountain hemlock BpS occupies some of the highest-elevation forested zones in the Cascade Mountains and can exist as tree clumps in a matrix of parkland. The lower elevation limit is around 4,500-5,000 feet in Washington. Sites are cold and characterized by deep persistent snowpack and short growing season. The late seral stands are dominated by mountain hemlock, but many other tree species are present throughout the geographic range of this BpS. In some areas, lodgepole pine (*Pinus contorta)* dominates post-disturbance stands. Mature stands may be nearly all mountain hemlock, or may have varying amounts of Pacific silver fir, subalpine fir (*Abies lasiocarpa)* and Douglas-fir (*Pseudotsuga menziesii)* across its range. Common understory species include Alaska huckleberry, big huckleberry, grouse whortleberry, and beargrass. Wildfire is the major disturbance event of this type, but occurs infrequently. Fire is generally stand-replacing because the major tree species are highly susceptible to fire mortality. Estimates of the return interval of wildfire range from 400 to over 1,500 years. The root rot *Phellinus weirii*, bark beetles, and other insects can be locally important disturbance agents. The lodgepole pine component is particularly susceptible to bark beetle infestation in late maturity.

- **North Pacific Mesic Western Hemlock-Silver Fir Forest**

  This Pacific Silver fir type occurs on the western slopes of the Cascades across low- to mid- elevations within the Pacific silver fir zone (3,000-4,500 feet). These forests are cool and moist and typically have high precipitation and moist topographic positions. This area has a moderate snowpack and usually a deep organic layer. Pacific silver fir and western hemlock (*Tsuga heterophylla)* are co-dominant in the mature canopy. The understory is predominantly composed of a well- developed layer of heath shrubs and lush herbs. It is distinguished from the other Pacific silver fir types by the moisture regime. This BpS is characterized by infrequent fires occurring at approximately 800-1000 year intervals. These events

are of high severity and large extent, resetting thousands of acres through stand replacement fire. It is difficult to burn, so fires are wind-driven when they are present. Even under wind-driven fire conditions, historic fires have gone out at the edge of this type. Although infrequent, avalanches and wind disturbances occur, but these disturbances are more frequent at scales of tens and hundreds of acres.

- **North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest**
  This Pacific silver fir type occurs throughout the west slopes of the Cascades at lower elevations within the Pacific silver fir zone (1,200 to 2,400 feet). It occurs above the western hemlock forests and below moister and cooler plant associations (silver fir-mountain hemlock) at higher elevations. This BpS is distinguished from the high elevation Pacific silver fir type by elevation breaks. Pacific silver fir is the dominant species in the mature canopy, which it shares with a wide variety of conifers depending upon locale. Douglas fir and western hemlock are co-dominant throughout the range. Subalpine fir, grand fir (*Abies grandis)*, western white pine (*Pinus monticola)* and Englemann spruce (*Picea engalmannii)* are common around Mount Adams. Noble fir (*Abies procerus)* is an associate. The understory is predominantly composed of a lush to moderate layer (depending upon the amount of moisture) of heath shrubs, forbs, ferns and mosses. This low elevation Pacific silver fir BpS is characterized by infrequent mixed severity fire regimes occurring at intervals greater than 100 years. These fires occur on the scale of thousands of acres and produce variably sized patches throughout the landscape. Landscapes are reset at intervals greater than 200 years through stand-replacing events. Avalanches and wind events are also common disturbances in this type but these disturbances more frequently occur at scales of tens and hundreds of acres.

- **North Pacific Maritime Mesic-Wet Douglas fir Western Hemlock Forest**
  This western hemlock-Douglas-fir BpS occupies low mountain elevations of western Washington and Oregon. It occupies mesic to wet microsites on all aspects at elevations up to 4,000 feet. Douglas-fir and western hemlock dominate this type with devil's club, various *Vaccinium* species, vine maple, rhododendron, Oregon oxalis, bear grass, sword fern, salal, Oregon grape and bunchberry dogwood as common understory herbs and shrubs. Fire plays a major, though infrequent, role resetting landscapes within this type, with intervals ranging roughly from 300 to 800 years. Mixed severity fires occur less frequently in this regime than in the Douglas-fir-western hemlock mesic-dry regime. Insects, pathogens and wind throw occur in this type at variable intervals, creating fine scale variability on the landscape. Although fires are often large (100s-1000 acres), fire severity patterns are quite variable, ranging from underburns to high severity patches within single events. Wind, insects and pathogens can create gaps of various sizes. Mature to old-growth forest stands of large individuals of Douglas fir and western hemlock with advanced regeneration of western hemlock dominate this BpS.

- **North Pacific Maritime Mesic Subalpine Parkland**
  This subalpine BpS occurs on the west side of the Cascade Mountains where deep, late-lying snowpack, steepness of slope and temperature are limiting environmental factors. Communities are typically on ridge crests, shoulders, or upper slopes. Clumps of trees interspersed with low shrublands and meadows

characterize this system. Associations include forested and subalpine meadow types. Major tree species are mountain hemlock, subalpine fir, and silver fir. Tree establishment happens in waves depending on seed years, weather, climate and snowpack. Hundreds of years can pass to reestablish trees. Much regeneration has occurred recently, but past waves of regeneration suggest that survivorship may be limited. There is very little disturbance overall. Fires occur as lightning strikes in tree islands, killing individual trees or clumps. These patches act as a firebreak, limiting fire spread to lower elevations. Ignitions of this type are probably quite common but typically remain in the one to ten acre size. Snow breakage and avalanches are the most significant medium-term disturbances. Climate change a main factor that determines succession patterns and patch re-initiation. Changes in temperature and precipitation patterns affect tree/meadow dynamics. Meadows dominated by re-sprouting shrubs and herbs with tree seedlings and saplings present at low cover make up the majority of the landscape.

- **East Cascades Mesic Montane Mixed-Conifer Forest and Woodland**
  This mixed conifer BpS occurs on low- to mid-elevation slopes in the east Cascades on various aspects where sites are strongly influenced by maritime climate. These sites typically occur on the relatively cool, moist end of the mixed conifer environmental gradient. Typically sites receive over 25 inches of precipitation. Vegetative composition will vary widely geographically, but is dominated by western hemlock, grand fir, and Douglas fir. Western larch (*Larix occidentalis)*, western white pine, western red cedar (*Thuja plicata)*, and Engelmann spruce may be present. Ponderosa pine may be locally important. Lodgepole pine may be present in some post-fire early seral stands. Forests are typically even-aged with scattered residuals (i.e., 1-3 fire-regenerated age classes present in patches) with moderately dense to dense stands including a dense conifer overstory with understories dominated by moist site forbs to tall shrubs. Shade-tolerant conifer species are well represented and dominate the tree understories of late-successional stands. Fires are mostly mixed severity (50-150 year frequency) with the wetter sites experiencing longer fire return intervals and higher severity fires (~200 year frequency). Scales of fires tend to be highly variable—from hundreds to thousands of acres in area. Less productive sites may be susceptible to insects or disease. Douglas fir bark beetle and spruce budworm will affect Douglas fir or grand fir. Root rots, butt rots, and stem decay will affect grand fir, western red cedar, and western hemlock while Douglas fir is less susceptible. Western white pine has been impacted by white pine blister rust and its abundance reduced in affected stands.

- **North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest**
  Very little of this type occurs in the wildernesses. It occupies low montane elevations of the western Cascades typically on well-drained soils. This type is most common on warm, southerly aspects up to 4000 ft in elevation. Douglas fir is the most common tree species found in this type. Western hemlock, western red cedar, grand fir, white pine, lodgepole pine, and are seral associates. Common understory herbs and shrubs include salal, dwarf Oregon grape, rhododendron, twinflower, vanilla leaf, and sword fern. Fire is the major disturbance process. Mixed severity fires are more common than stand replacing events, occurring at 50-150 year frequencies. Stand replacement fires reset large landscapes at 250-500 year frequencies. Although fires are often

large (hundreds to thousands of acres), fire severity patterns are quite variable, ranging from underburns to high severity patches within single events. This fire regime is largely responsible for the dominance of Douglas fir in these landscapes. Insects, pathogens and wind throw also occur in this type at variable intervals, often interacting with drought and other extreme weather conditions and create gaps of various sizes.

- **Unforested**

  Unforested areas occur primarily at the highest elevations as bare rock. Scattered areas of bare rock occur along ridges and outcroppings as well. Meadows and water bodies are included in the unforested classification and serve as natural fuel breaks.

- Mt. Adams Wilderness:
  - North Pacific Mountain Hemlock Forest- Xeric- 45%
  - North Pacific Mountain Hemlock Forest- Wet- 27%
  - Unforested- 24%
  - North Pacific Mesic Western Hemlock-Silver Fir Forest- 3.0%
  - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- 2%
  - North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest- 0.5%

- Goat Rocks Wilderness:
  - North Pacific Mountain Hemlock Forest- Wet- 32%
  - North Pacific Mountain Hemlock Forest- Xeric- 29%
  - North Pacific Mesic Western Hemlock-Silver fir Forest- 17%
  - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- 17%
  - North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest- 2%
  - Unforested- 0.5%

- Tatoosh Wilderness:
  - North Pacific Mountain Hemlock Forest- Wet- 37%
  - North Pacific Mesic Western Hemlock-Silver Fir Forest- 24%
  - North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest- 19%
  - North Pacific Mountain Hemlock Forest- Xeric- 11%
  - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- 8%

- William O. Douglas Wilderness:
  - North Pacific Mountain Hemlock Forest- Wet- 60%

- North Pacific Maritime Mesic Subalpine Parkland- 15%
- North Pacific Mesic Western Hemlock-Silver Fir Forest- <10%
- North Pacific Mountain Hemlock Forest- Xeric- <10%
- North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- <10%

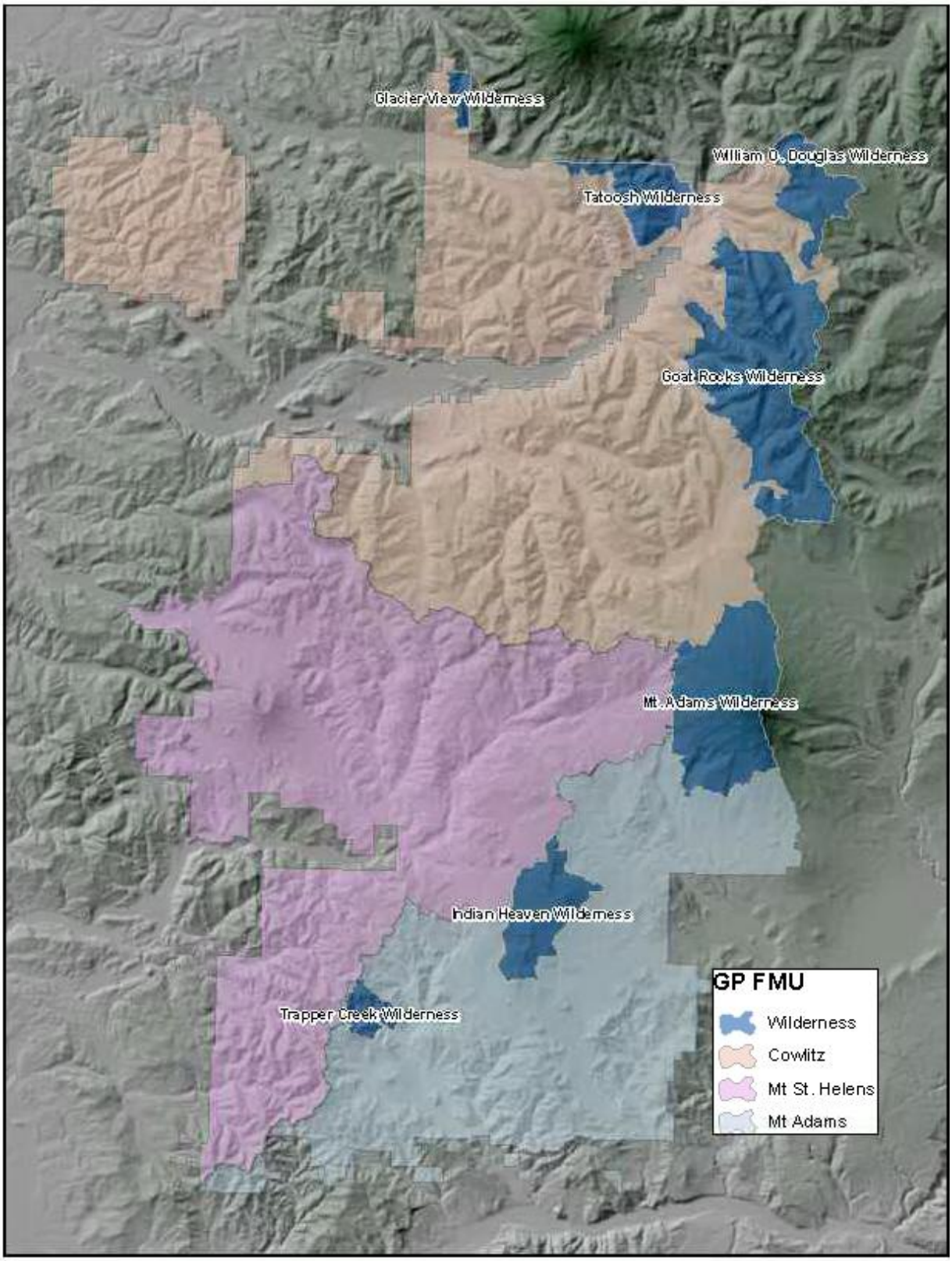
- Indian Heaven Wilderness:
  - North Pacific Mountain Hemlock Forest- Wet- 40%
  - North Pacific Mountain Hemlock Forest- Xeric- 40%
  - North Pacific Mesic Western Hemlock-Silver Fir Forest- 15%
  - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- 5%

- Trapper Creek Wilderness:
  - North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest- 45%
  - North Pacific Mesic Western Hemlock-Silver Fir Forest- 35%
  - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- 15%
  - North Pacific Mountain Hemlock Forest- Wet- 5%

- Glacier View Wilderness:
  - North Pacific Mesic Western Hemlock-Silver Fir Forest- 55%
  - North Pacific Mountain Hemlock Forest- Wet- 35%
  - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest- 10%

- **IA assets assigned to this FMU:**
  - Mt. Adams Wilderness—See Mt. Adams FMU
  - Goat Rocks Wilderness— Shared response between Cowlitz Valley Ranger District and Wenatchee National Forest
  - Tatoosh Wilderness—See Cowlitz Valley FMU
  - William O. Douglas Wilderness—Shared response between Cowlitz Valley Ranger District and Wenatchee National Forest
  - Indian Heaven Wilderness—See Mt. Adams FMU
  - Trapper Creek Wilderness—See Mt. Adams FMU
  - Glacier View Wilderness—See Cowlitz Valley FMU
- **IA Dispatch Office:** Columbia Cascade Communication Center
- **LRMP options available for management response:** Fire suppression strategies depend upon specific Management Area standards and guidelines, alternative suppression strategies to consider include confine, contain and control. Section 3.1.1. Gifford Pinchot Land and Resource Management Plan and Table 3.1 of this document, summarizes management response suppression strategies for specific Management Areas.

FMU Map


Glacier View Wilderness
William O. Douglas Wilderness
Tatoosh Wilderness
Goat Rocks Wilderness
Mt. Adams Wilderness
Indian Heaven Wilderness
Trapper Creek Wilderness
GP FMU
Wilderness
Cowlitz
Mt St. Helens
Mt Adams

3.2.4.2 FMU Guidance

- **Desired Conditions, Objectives, Guidelines, Goals and Standards:** Section 3.1.1. Gifford Pinchot Land and Resource Management Plan *and FMU* Guidance, Table 1.1. Management Response Strategies for LRMP Designated and Management Areas provides a summary of guidance for this FMU.

3.2.4.3 FMU Characteristics

3.2.4.3.1 Safety

Firefighter and public safety is the primary concern. Limited accessibility, steep terrain, and areas of heavy timber can challenge the efficacy and safety of suppression efforts. Where these concerns arise, suppression tactics that minimize threats to firefighter and safety will be employed, including using aerial support and confine strategies. Recreation and land use closures will be ordered as needed to maximize public safety.

- Fire fighter safety remains the utmost priority. Terrain, accessibility, and potential fire behavior in the wildernesses will influence fire management decisions.
- Public safety: maximum visitor safety will be accounted for through a specific public safety plan incorporated into the communication plan including contact with local media, information and signing at the forest headquarters, ranger stations, trailheads, campgrounds, and locally as needs determine. Coordination will be maintained as necessary with tribes, Washington DNR, county leaders, and other interested and/or affected parties.
- Communities most likely to be affected by smoke are Trout Lake from the Mt. Adams Wilderness and Packwood and Randle from the Goat Rocks and Tatoosh Wildernesses. Smoke impacts will be considered during daily incident evaluations.
- Mountain weather is unpredictable. Thunderstorms and instability in the atmosphere contribute to fire ignition as well as fire spread.
- Large amount of fuels has accumulated in some of the wildernesses below tree line. Down woody debris makes travel difficult and contributes to fire severity and spread.
- Whenever possibly, flights over wildernesses should be avoided. Should air support be needed, a map of known aviation hazards will be provided.

3.2.4.3.2 Physical Characteristics

- Mt. Adams Wilderness— The Mt. Adams Wilderness is located on the west slope of Mt. Adams, featuring the 12,276 foot peak, the second highest in the northwest. Over 60% of lands in this wilderness are forested with the remainder being rock, lakes, and streams. A diverse vegetative landscape results from the mixture of dry eastside and moist west side weather conditions with evident patterns in relation to elevation bands.

- Goat Rocks Wilderness— The Goat Rocks Wilderness is situated between Mt. Adams and Mt. Rainier along the Cascade Mountains. It features rugged, mountainous terrain dissected by numerous waterways and ridges with peaks eroded from an ancient volcano and elevations between 3,000 and 8,201 feet. A good portion of the wilderness lies in an area featuring alpine conditions above timberline, while lower elevations feature heavy to moderate amounts of timber.
- Tatoosh Wilderness— The Tatoosh Wilderness is directly south of Mt. Rainier National Park. It is a diverse physical environment with steep and rugged subalpine and alpine areas along the ridgeline to densely forested river bottoms. This wilderness is relatively wet and low in elevation compared to Mt. Adams and Goat Rocks.
- William O. Douglas Wilderness— The Gifford Pinchot National Forest administers 15,880 acres of the William O. Douglas Wilderness, which covers 166,000 acres between the White Pass and Chinook Pass highways. The remainder of the wilderness is administered by the Okanogan-Wenatchee National Forest. The western boundary borders Mt. Rainier National Park. Minerals, fish, and other wildlife are abundant throughout the area's hundreds of small lakes, scattered peaks, and steep slopes. The Pacific Crest National Scenic Trail goes through this wilderness as well.
- Indian Heaven Wilderness— The Indian Heaven Wilderness straddles the Cascade Crest between Mt. Adams and the Columbia River Gorge. It is a relatively recent addition to the wilderness system (1984) comprised of rolling landscapes with open meadows, forests, and 175 lakes. The highest point is Lemei Rock at 5,927 feet. Though there are rock outcroppings, none of the area extends above tree line.
- Trapper Creek Wilderness— Trapper Creek Wilderness is located in the Wind River watershed on the west side of the Mt. Adams Ranger District. Streams and waterfalls are plentiful throughout the steep slopes at the lower elevations, while huckleberry fields occur in the higher elevations near Observation Peak. A small lake in the southern portion of the Wilderness adds to the diversity of habitats in the area.
- Glacier View Wilderness— The Glacier View Wilderness is located on the west boundary of Mt. Rainer National Park. The topography allows a high degree of isolation with popular peaks Mt. Belijica (5,476 feet) and Glacier View Point (5,507 feet).

3.2.4.3.3 Biological Characteristics

- Wildlife habitat: Where habitat exists, northern spotted owls may inhabit the wildernesses as well as barred owls, pileated woodpeckers, goshawks, and bald eagles. Other wildlife includes blacktail deer, Roosevelt elk, and black bear, cougar, bobcat, and pine marten. Mountain goats are found at higher elevations.

- Headwaters to major rivers throughout the forest and Columbia River Basin are located in the wildernesses.
- Several rare and culturally important botanical resources are found in the wildernesses. Most of the subalpine meadow habitat on the Gifford Pinchot National Forest is located in the wilderness.

3.2.4.3.4 Resources

Specific resource concerns will be addressed for each fire and resource advisors will provide guidance in management direction and prioritization. Cumulative effects will become a concern if significant acres are affected over a short period of time. Resource specialists will work with the line officer as decisions are made.

- Soil: Potential effects of fire to soil include the combustion of surface litter and duff layers, changes in color and chemical composition through the release of carbon, nitrogen and phosphorous in the consumption of live and dead biomass, hydrophobicity, erosion, and debris slides. Low and moderate intensity fires are unlikely to result in effects that significantly influence ecosystem composition and productivity. High severity fires increase the probability for erosion and landslide, but the predominant fire regime over most of the area is one that primarily experiences high severity fire, making these disturbance events within the natural range of variability.
- Wildlife: Direct and indirect effects of fire to wildlife vary by species and the timing and intensity of the burn. They can include reduction or loss of habitat, harassment, displacement, or death from fire, smoke, and disturbance from suppression activities. The potential for sedimentation and loss of fish habitat will be address for all fires occurring near major waterways, particularly where the fuel loadings are outside of their natural range of variability.
- Botanicals: Threatened and endangered botanical species will be handled in the same way as wildlife. The adaptability or susceptibility of a particular species to fire will be specifically considered along with potential fire intensity and extent.
- Clean air and water: Fires should be managed to limit adverse effects to these resources.
- Recreation: Fires may inconvenience recreational users either by displacement or visual impacts.

3.2.4.4 FMU Fire Environment

Historical fire maps indicate several large fires in the wilderness areas during the mid- to late- 1800s and early-1900s. Determination of the exact historic size and number of fires before settlers came to the area is difficult, yet evidence suggests that nearly all these fires were stand-replacing. Many were lightning caused, but anthropological evidence suggests that local fire regimes were highly influenced by Native Americans and sheep herders who set fires in early fall to improve the production of huckleberries and forage. The introduction of fire suppression and federal protection of lands greatly decreased the size and frequency of fires in the area. The majority of fires in wilderness areas since 1970 have occurred in summer months and been lightning caused and low intensity with some passive crowning. Fire suppression efforts and associated precipitation that often accompanies summer thunderstorms have kept recent fires

relatively small. Climatic variations dictate the average frequency of lightning storms and ignitions by influencing the potential for storms and fuel flammability. When an ignition occurs, topography, wind, fuel type, and fuel loading play an important role in the impacts of fire on the landscape. Uncontrolled fires before the era of fire suppression occurred in various landscapes, fuel loading, stages of succession, and under different weather and topographic conditions to create a mosaic on the landscape. According to Habeck and Mutch (1973) "…past, uncontrolled fires did not, at any point in time, create a completely burned over and denuded landscape, because many stages of successional development can usually be found in each forest zone."

Fuel Models

The 13 standard fire behavior fuel models (FBFMs) were developed to serve as inputs to Rothermel's mathematical surface fire behavior and spread model (Rothermel 1972). They represent distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types. The FBFMs are separated into grass, brush, timber litter, or slash groups and then broken down further by loading by size class, fuel bed depth, and moisture of extinction.

A majority of the wilderness areas of the Gifford Pinchot National Forest are classified as FBFM 10 according to LANDFIRE data. FBFM 10 has the heaviest fuel loading of the timber litter group. Anderson (1982) describes it as follows:

> The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in the fuel situation, leading to potential fire control difficulties…examples are insect- or disease-ridden stands, wind-thrown stands, over mature situations with deadfall, and aged light thinning or partial-cut slash.

In general, lower elevation forested areas up to around 5,000 feet can be described as FBFM 10. Particularly high fuel loadings are found in the Trapper Creek Wilderness and in areas on the south slopes of the Mt. Adams and Goat Rocks Wildernesses that have been affected by insects and disease.

FBFM 8 is the next most common type, occurring generally above 5,000 feet and up to timberline:

> Slow-burning surface fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. (Anderson 1982)

FBFM 9 is found along some of the riparian areas. It is characterized by long-needle conifers and hardwoods. Overall, fires run through the surface litter faster than FBFM 8 and have longer flame height but with less intensity than FBFM 10 (Anderson 1982).

Less than 5% of the land is grassy meadows (FBFM 1) and shrub-dominated lands (FBFM 5). The grass models have potential for high rates of spread but that fire behavior is extremely unlikely with the amount of annual moisture received in the study

areas. These meadows and marshlands typically stay green and are considered fuel breaks. In FBFM 5, areas where fires are carried by shrubs and other surface fuels, "The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material" (Anderson 1982).

Fire Regimes

Fire regimes are broken down based on the historical role of fire across a certain landscape without the influence of modern human intervention but including the influence of aboriginal fire use (Agee 1993; Brown 1995). The LANDFIRE models for biophysical settings used in this analysis classify fire regimes into five groups based on average fire frequency and severity indicated by percent overstory replacement. The following fire regime definitions use 25 and 75 percent as severity thresholds between low, mixed, and replacement regimes (FRCC Guidebook Version 1.3.0).

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+ years	Replacement/ any severity	Generally replacement-severity; can include any severity type in this frequency range

The majority of the wilderness areas in this plan are comprised of high elevation, wet BpS's that fall into fire regime group V. However, there a few lower, drier sites characterized as fire regime group III.

- Mt. Adams Wilderness—

  Nearly all lands fall into fire regime group V with average fire return intervals ranging from 300-1500 years. The North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest covers <2% of the land primarily in lower elevation areas on the south end of the forest and is in fire regime group III. Lightning-caused fires are common both within and adjacent to the wilderness. Fuels are categorized as FBFM 10 primarily at lower elevations and FBFM 8 at higher elevations though this can vary.

  Fires occurring in or near the southern portion of the wilderness are of particular concern due to the close proximity to the Gotchen Late Successional Reserve. Spruce budworm outbreaks over the past 30 years have left large tracts of standing dead timber and fire suppression has contributed abundant ladder fuels in the form of grand fir regeneration.

Records indicate that the 316 acre Salt Creek Fire in September of 2001 was the last large fire within the wilderness boundary. Other notable large fires include the 150 acre Lava Fire in 1987. The 8,000 acre Cold Springs Fire burned just south of the wilderness in 2008. In all, there have been approximately 50 lightning-caused fires since 1970.

- Goat Rocks Wilderness—

  A majority of the lands fall into fire regime group V with average fire return intervals ranging from 300-1500 years with the exception of the North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest type, which covers approximately 17% of the wilderness. This BpS is found in lower elevation areas and is in fire regime group III. Although lightning strikes frequently, large fire occurrence is rare. Where large fire potential does exist, fire suppression has nearly eliminated them from the landscape. Most fires are single tree or small stand lightning strikes that do not significantly alter the landscape. The LANDFIRE data used to analyze this landscape estimates 75% of the area as a FBFM 10, 12% in FBFM 8, scattered brush areas (FBFM 5), FBFM 9 in the drainages, and unforested ridges. Local knowledge suggests FBFM 10 covers closer to 60% of the area and FBFM 8 covers approximately 30%.

  The last large fire in the Goat Rocks was the Lost Lake Fire (321 acres) in 2003. Also notable was the Two Lakes Fire that burned several thousand acres on the south end of the wilderness in the first half of the 20th century. In all, there have been 69 lightning-caused fires in the Goat Rocks Wilderness since 1970.

- Tatoosh Wilderness—

  Approximately 10% of the area in the Tatoosh Wilderness falls into a Fire Regime group III while the rest is in V. Approximately 80% of the area is a FBFM 10; 10% is FBFM 8; less than 5% is grass and brush models; FBFM 9 occupies the drainages, and rocky ridges are unforested. There have been nine fires in the Tatoosh Wilderness since 1970 and no historic large fires are recorded for the past 100 years.

- William O. Douglas Wilderness—

  Over 85% of the area is a FBFM 10 with some FBFM 9 in wet areas and FBFM 8 at higher elevations. Local knowledge suggests the portion of FBFM 10 is slightly lower and FBFM 8 is higher. There have been 38 lightning caused fires since 1970, the largest of which was the 100-acre White Pass Fire of 1998. Also important to note is that adjacent lands to the east, administered by the Wenatchee National Forest, are drier fuel types with greater fire potential. The portion administered by the Gifford Pinchot is a wetter, west slope area.

- Indian Heaven Wilderness—

  With the exception of the small area occupied by North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest, all BpS's in this wilderness are part of fire regime group V, experiencing very long fire return intervals. The area just north of the wilderness, comprising much of the Sawtooth Berry Fields was burned in the late 1890's and again in 1902 in the Lewis River Fire; however, most of the wilderness was unaffected. The berry fields were maintained by Native Americans with subsequent fires and other reburns of the Lewis River Fire. Since 1970, there have been 19 recorded fires within the wilderness boundary but no recent large fires. There are several wet areas, particularly around the numerous lakes and wet meadows that fall into a FBFM 9. There is a scattering of brush fuel types, FBFM 8 in some of the higher upper elevations, and the remainder of the land is FBFM 10 (approximately 80%).

- Trapper Creek Wilderness—

  All but approximately 15% of the Trapper Creek Wilderness falls into fire regime group V. The remaining 15% is in fire regime group III. Large amounts of large woody debris are present under a dense canopy cover, resulting in a FBFM 10 over most of the area. The relatively higher sites are FBFM 8. The Trapper Creek Wilderness is relatively low in elevation, wet, and heavily timbered. There are no recent large fires on record for the Trapper Creek Wilderness.

- Glacier View Wilderness—

  Ten percent of the land is in fire regime group III with the remainder in group V. It is primarily FBFM 10 with FBFM 8 and high elevations.

3.2.4.4.1 Fire Behavior

Potential fire behavior was estimated based on simulations using the FARSITE Fire Model-Simulator. Fuels, weather, and topography dictate the intensity and rate of spread under the various scenarios. The Rare Event Risk Assessment Program (RERAP) determines the probability of some undesired fire movement by considering probable fire behavior based on weather and terrain influences as well as the probability of a fire stopping or season ending event.

- Mt. Adams Wilderness— Fires occurring in this wilderness can be either cross slope wind driven or backing/flanking fires. Uphill runs do not generally pose control problems as the ridge tops are barren rock with intermittent glaciers. One area of concern is the south and southwest facing slopes where steep terrain, heavy dead and down, and scattered mortality contribute to higher fire intensity levels and rates of spread. Winds of concern are from the west, northwest. The mountain provides a shield from the east winds that historically have not had any effect on fire behavior characteristics.

- Goat Rocks Wilderness— Rates of spread in the Goat Rocks Wilderness rarely exceed two feet per minute. The higher rates of spread occur as fires burn uphill. The rugged topography limits the length of uphill runs, alternating spread patterns with backing and flanking. Aspect does not appear to have had a major influence on rate of spread. Those fires starting at slope bottoms have higher initial rates of spread. Some ignitions become trapped in enclaves along ridges and cease growth beyond that point. The RERAP results indicate that fires ignited before September have high probabilities of escaping the wilderness boundary if no management actions are taken. Those ignited during or after September have progressively lower chances based on shorter burn periods and greater likelihood of a season ending event.
- Tatoosh Wilderness— The topography of the Tatoosh Wilderness contributes to the greatest projected rates of spread in any of the wilderness areas. It has the largest continuous opportunities for uphill runs. However, the north-south ridge through the center of the wilderness creates a topographic pull for most fires started to run towards the center of the wilderness rather than at the boundary. Though these fires experience high rates of spread toward the ridge, they then slow down as the behavior changes to a backing fire. RERAP indicates low probabilities for escape with the exception of fires starting in the northwest arm of the wilderness.
- William O. Douglas Wilderness— The William O. Douglas Wilderness experiences some higher rates of spread but rarely above four feet per minute. The highest rates of spread occur on the steepest slopes, which tend to be found on the north end and in the east-west drainages. The central-eastern portion of the wilderness becomes flatter where the boundary meets the section of the wilderness administered by the Wenatchee National Forest. Fires occurring in that area appear to pose very little threat to the boundary of the portion administered by the Gifford Pinchot National Forest. Again, the RERAP results show probability of escaping the wilderness boundary as proportional to the amount of time an ignition is allowed to burn entirely unmanaged. Fires ignited in June-August pose the greatest risk of escape, while those in September experience lower probabilities.
- Indian Heaven Wilderness—Although Indian Heaven has several mountain peaks, there are no large changes in elevation or steep slope gradients. Therefore, Indian Heaven Wilderness experiences relatively low rates of spread, rarely exceeding two feet per minute. A wind-dominated fire spread event would likely exceed the projected rates of spread. RERAP analysis shows similar results to the other wildernesses in that fire starting before September have a high probability of escaping the wilderness boundary.

- Trapper Creek Wilderness— A drainage splits the Trapper Creek Wilderness in half from northwest to southeast. The topography associated with the various small peaks and ridges within the wilderness will influence direction and rate of spread of fires. Trapper Creek Wilderness is typically quite wet, but, under dry fuel moisture conditions, the quantity and density of fuels may result in high fire intensities and rates of spread. There are no recent large fires on record for Trapper Creek.
- Glacier View Wilderness— There are a couple small peaks along the ridge on the western boundary of the Glacier View Wilderness. The Glacier View Wilderness is typically wet, but under dry conditions could experience high fire intensities and rates of spread in the heavy fuels. Accessibility may be an issue. There are no recent large fires on record for Glacier View.

3.2.4.4.2 Weather

The majority of the wildernesses discussed in this document can be described as cool and moist with significant winter snowpack. Areas west of the Cascade Crest receive more precipitation than those wildernesses located on the Crest, specifically the south and east portions of the Goat Rocks, Mt. Adams, and William O. Douglass Wildernesses.

Temperatures vary considerably each day and throughout the year. Weather data from the Western Regional Climate Center from 1971-2000 at the Mt. Adams Ranger Station shows average maximum temperatures of around 74 degrees Fahrenheit for June and September and 82 degrees for July and August. Average minimums were around 24 degrees in December and January. Average mean annual precipitation is 43.4 inches with less than an inch in each July and August and 1.0-1.5 inches in each June and September.

Weather data records for Packwood, WA show average maximum temperatures of 78 degrees for July and August and 71-73 degrees for June and September. Average minimums were around 29 degrees in December and January. Average mean annual precipitation is 57.8 inches with just over an inch falling in each July and August and 2-2.4 inches in each June and September. The majority of precipitation falls from November through February in both of the aforementioned areas.

Precipitation becomes increasingly higher as you move toward the west. The Trapper Creek Wilderness may experience up to 120 inches of annual precipitation.

Wind speeds and direction vary, but typical prevailing winds are from the southwest for the Mt. Adams, Trapper Creek and Indian Heaven Wildernesses and from the northwest for the Goat Rocks, Tatoosh, William O. Douglass, and Glacier View Wildernesses. The topography in the wildernesses is such that while one area may be exposed to high winds, there are others that are sheltered and are influenced very little by wind. Historically, fall east wind events have been known to cause drying and significantly influence fire behavior and spread.

Trends indicate that energy release components (ERC) rise continually from the onset of the fire season until mid-August when there is a dip caused by a late-summer precipitation event. August precipitation event is rarely season-ending, and the ERC often increase to or surpass the point at which they were before the precipitation event. A season-ending event typically occurs sometime between late-September and mid-October. RERAP shows the following probabilities of season ending events by certain dates according to weather data from 1999-2008. The Hagar remote area weather station (RAWS) was used to represent the Goat Rocks, Tatoosh, Glacier View, and William O. Douglass Wildernesses; Trout Creek RAWS represents the Mt. Adams Wilderness, and Dry Creek RAWS represents Indian Heaven and Trapper Creek Wildernesses.

RAWS Weather Station	October 1	October 7	October 15
Hagar	49%	76%	98%
Trout Creek	51%	68%	86%
Dry Creek	54%	82%	99%

In the absence of other concerns, weather is the key factor in management decision making around late season fires. The length of time until a season-ending event, current ERC, and the likelihood of east wind events influence management strategies. East wind events have contributed to large fire growth in the majority of historical large fires on the Gifford Pinchot National forest. East winds are a factor in the Indian Heaven Wilderness, Trapper Creek, on the south side of the Mt. Adams Wilderness, in the east-west drainages of the William O. Douglas, and the east side of the Tatoosh, but do not play much of a role on the west slopes of Mt. Adams, Goat Rocks, or Tatoosh, which are sheltered by the peaks.