U.S. Department of Agriculture Forest Service

Wildland Fire Management

FY 2024 LARGE FIRE REVIEW

Contents

Reporting Requirements

Division O of the Consolidated Appropriations Act, 2018 (Public Law 115–141), known as the "Stephen Sepp Wildfire Suppression Funding and Forest Management Activities Act," authorizes annually adjusted budget authorities for fiscal years (FYs) 2020 through 2027 for the purposes of wildfire suppression operations in the Wildland Fire Management and Wildfire Suppression Operations Reserve Fund accounts at the Department of Agriculture or the Department of the Interior. The law also requires financial reporting if the additional budget authority was exercised in a fiscal year.

In addition to the base Wildland Fire Management Suppression appropriations ($1.011 billion for the Forest Service), the Departments of Agriculture and the Interior were authorized access to $2.65 billion in FY 2024 from the Wildfire Suppression Operations Reserve Fund to pay for the costs of wildfire suppression, including support, response, and emergency stabilization activities, other emergency management activities, and the funds necessary to repay any transfers needed for the costs of wildfire suppression operations.

This document addresses reporting requirements for FY 2024, as described in Division O of Public Law 115–141 (Section 104).

Executive Summary

Wildland fire statistics are collected and analyzed by calendar year. Therefore, reporting on fire activity during Fiscal Year (FY) 2024 requires examining data from two different fire years. The first quarter of FY 2024 occurred during the final quarter of the fire year 2023, and the remaining quarters of FY 2024 correspond to the first three quarters in fire year 2024. Wildfire responses and their associated accounting often span fiscal and/or calendar years as well. As a snapshot of fire and fiscal activities during FY 2024, this report illustrates trends and averages in the USDA Forest Service Fire and Aviation Management program. Final financial statements for large fires may take multiple fiscal years to complete as cost-share agreements, cost-recovery efforts, and invoice submissions are reconciled.

After reviewing FY 2024 fire activity, the Forest Service analyzed five large incidents on National Forest System lands, all of which burned over 50,000 acres and exceeded $20 million in suppression costs.

FY 2024 Forest Service's suppression costs were approximately $3.652 billion. This included payments associated with late FY 2023 fire activity and FY 2024 activity. These costs were funded from $1.011 billion in annual suppression appropriations, $2.63 billion in transfers from the Wildfire Suppression Operations Reserve Fund, with the remainder from prior year carryover and recovery.

Suppression costs for the five analyzed incidents totaled approximately $199 million as of the end of FY 2024 (September 30, 2024). Cost drivers for the sampled incidents included contracting for ground-based resources and retardant, agreements for partner personnel and resource contributions, fleet, employee payroll and benefits, aviation contracts, supplies, casual pay for Administratively Determined personnel, and travel contracts, agreements, fleet, personnel, aviation, casual pay, supplies, materials, transportation of things, and travel.

This report places the Forest Service's sampled fires within the larger national fire activity environment of FY 2024. Information regarding the Fire and Aviation Management program is included to provide context and illustrate investments and development in areas such as risk management, fire management, and landscape restoration. These advances have been made possible by collaborative partnerships with federal, state, Tribal, local agencies, and with numerous stakeholder engagements. FY 2024 investments in Fire and Aviation Management were critical support for the agency's mission of sustaining the health and productivity of the nation's forests and grasslands to meet the needs of present and future generations.

The five fires analyzed in this report burned more than 500,000 acres combined. Some exhibited extreme fire behavior and in some areas, damaged natural and cultural resources, or community infrastructure. In other areas, fire assumed a natural disturbance role and produced landscape ecological benefits. According to Incident Status Summary reporting, communities, essential infrastructure, and thousands of structures were threatened, some in challenging and isolated areas. Sixty-four residences and 81 other structures were destroyed by these five fires.

Costs associated with a wildfire incident may take multiple years to resolve as cost-share agreements, cost-recovery efforts, and invoice submissions are reconciled. As of the end of FY 2024 (September 30, 2024), the Forest Service response costs for these five fires totaled nearly $199 million.

Overview

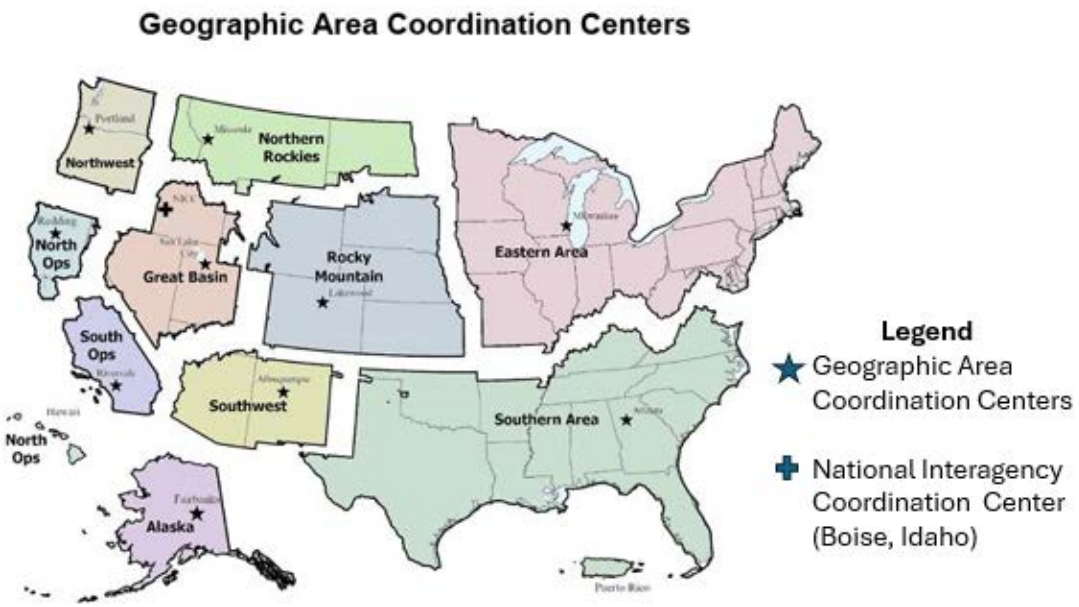
Federal Coordination

Wildfires often cross jurisdictional boundaries, requiring Federal agencies to join forces with other state, Tribal, local government, nongovernmental organizations, and the engaged American public. The Federal wildfire workforce includes employees of the Forest Service and the Department of the Interior's Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and Bureau of Indian Affairs. Together, these agencies manage wildland fire on nearly 700 million acres of federal public land, approximately one-fifth of the total land area of the United States. The agencies work together at the National Interagency Fire Center in Boise, Idaho where the National Interagency Coordination Center is also located. The Administration is currently undertaking efforts to unify these disaggregated wildfire response functions primarily within the Department of the Interior's U.S. Wildland Fire Service.

Geographic Area Coordination Centers

Regional Geographic Area Coordination Centers provide logistical coordination and mobilization of resources within and between geographic areas as necessary. The Geographic Area Coordinating Centers support not only the response for wildfire emergencies, but also other emergencies such as earthquakes, floods, hurricanes, tornadoes, etc. This model meets the expectations of the public, states, and Congress for cost-effective resource sharing among public agencies. Figure 1 below illustrates the geographic areas.

Figure 1. Map of Geographic Areas and Coordination Centers



National Multi-Agency Coordinating Group

The National Multi-Agency Coordinating group provides an essential management mechanism for national level strategic coordination to ensure that wildland firefighting resources are efficiently and appropriately managed in a cost-effective manner. In addition to the Forest Service, the group includes wildland fire representatives from the Department of the Interior (Bureau of Land Management, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, and the National Park Service), the U.S. Fire Administration, and individual states through the National Association of State Foresters.

The National Multi-Agency Coordinating Group facilitates national wildland fire operations through the following roles and responsibilities:

- Establish national priorities among the ten geographic areas.
- Direct appropriate available resources to meet national priorities.
- Determine National Preparedness Levels (PL 1-5).
- Anticipate and identify future national fire management resource requirements.
- Oversee general business practices between the National and Geographic Multi-Agency Coordination groups.
- Provide directional oversight for the Interagency Standards for Resource Mobilization.

In FY 2024, the National Multi-Agency Coordinating group supported the implementation of Complex Incident Management to improve incident response capability. In FY 2024, 44 Complex Incident Management Teams were in the national rotation.

To pool resources, manage costs, and coordinate national fire suppression efforts, the National Multi-Agency Coordination establishes preparedness levels throughout the calendar year to ensure suppression resource availability for emerging incidents across the country. Table 1 below describes Preparedness Levels which are dictated by fuel and weather conditions, fire activity, and fire suppression resource availability throughout the country.

Table 1. National Preparedness Level Summary

Preparedness Level (PL)	Resource Impact Summary	5-year Average Annual # of Days at Level
PL 1	Geographic areas accomplish incident management objectives using local resources with little or no national support. Little risk exists for drawing down capability in any geographic area to support incident operations.	183
PL 2	Active geographic areas may require national support to accomplish incident management objectives. National resource capability remains stable enough to sustain incident operations and meet objectives in active geographic areas. Low to moderate probability that drawing down resources from non-active geographic areas may pose a risk should existing conditions change.	77
PL 3	National mobilization of resources is required to sustain incident management operations in active geographic areas. National priorities are established to address the demand for shared resources among active geographic areas. Moderate to high probability that drawing down resources from non-active geographic areas may pose a risk should existing conditions change.	46
PL 4	National resources are heavily committed. National mobilization trends affect all geographic areas and regularly occur over larger distances. National priorities govern resources of all types. Heavy demand on inactive/low activity geographic areas for available resources.	25
PL 5	National resources are heavily committed, and additional measures are taken to support geographic areas. Active geographic areas must take emergency measures to sustain incident operations. Inactive/low activity geographic areas are reaching drawdown levels.	34

Each preparedness level includes specific management actions and involves increasing levels of interagency resource commitments. As preparedness levels rise, so does the need for incident management teams and fire suppression resources, including wildland fire crews, engines, support personnel, specialized heavy equipment, helicopters, and airtankers and other aircraft.

Emergency Support Function #4

The National Response Framework[1] guides the country's response to all types of disasters and emergencies. The framework includes Emergency Support Functions[2] that group resources and capabilities into functional areas, providing a structure to coordinate Federal support to local, state, Tribal, territorial, and insular area agencies, as well as to federal interagency incident responses. Emergency Support Function #4 – Firefighting provides the types of expertise found in the firefighting workforce for incidents requiring a coordinated national response. Requests for firefighting resources through Emergency Support Function #4 – Firefighting are coordinated through the National Interagency Coordination Center in Boise, Idaho.

FY 2024, the Forest Service supported the following emergency responses:

- May – Iowa severe storms and tornados
- June – New Mexico fires and flooding
- July – Hurricane Beryl
- August – Tropical Cyclone Debby
- September – Hurricanes Helene and Milton

The Hurricane Helene response was significant. Through Emergency Support Function #4 – Firefighting, ten Incident Management Team assignments and over 300 responders supported FEMA and the State of North Carolina in the Federal response, with missions including emergency road clearing, logistics and public information support, and other command and control functions.

Summary of National FY 2024 Fire Activity

During FY 2024, all agencies reported 50,229 wildfires nationally with 8 million acres burned across the United States. The Forest Service had protection responsibilities for 5,828 fires, with over 2 million acres burned. [3]

[1] https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response

[2] https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response#esf

[3] National wildfire data gathered from the National Interagency Coordination Center's Incident Management Situation Reports for fiscal year 2024 www.nifc.gov/sites/default/files/NICC/1Incident%20Information/IMSR/Understanding%20the%20IMSR%202024.pdf

Quarter 1 (October 1 – December 31, 2023)

Table 2. FY 2024 Quarter 1 (October 1 - December 31, 2023) Fire Summary

Number of fires occurring over All Jurisdictions	Number of acres burned over All Jurisdictions	Number of fires occurring on National Forest System Lands	Number of acres burned on National Forest System Lands
11,376	191,548	879	21,715

October 2023: Very dry and occasionally windy conditions resulted in a brief uptick in fire activity across California, the Southwest, and southern Colorado. Several large fires continued in the Southern area, mainly in the deep South and southern Appalachians.

November 2023: Large fires were reported in every southern state. Multiple Complex Incident Management Teams were assigned, as fire activity increased in the East near the United States-Mexico border. Most of the continental U.S. had below normal precipitation and near to above normal temperatures resulting in continued extreme to exceptional drought in Louisiana and Mississippi, Iowa, Nebraska, and New Mexico.

December 2023: Most of the West recorded a below normal snowpack at the end of December, with most areas receiving near to below normal precipitation during Quarter 1. The late-season fire activity in coastal California was unusually light as atmospheric rivers kept fire activity below typical levels across the state, even during multiple periods of offshore winds. A limited number of large fires burned briefly across the country in December, mainly in the Eastern, Southern, and Southwestern states. Significant fire activity was minimal over the last half of the month. At the end of calendar year 2023, annual acres burned for the U.S. remained well below the 10-year average at just over 37%, with slightly below average number of fires as well (95% of the normal average).

Quarter 2 (January 1- March 31, 2024)

Table 3. FY2024 Quarter 2 (January 1-March 31, 2024) Fire Summary

Number of fires occurring over All Jurisdictions	Number of acres burned over All Jurisdictions	Number of fires occurring on National Forest System Lands	Number of acres burned on National Forest System Lands
16,080	800,258	643	60,892

January and February 2024: January and most of February were relatively quiet across the U.S., with a below average number of fires and only 30% of the 10-year average acres burned. However, fire activity increased at the end of February due to a heat wave across the Southern Plains. On February 25 and 26, the heat wave was followed by strong westerly winds ahead of a

cold front and strong northerly winds behind the front. Several new and significant fires began during this event, including the largest fire in Texas history – the Smokehouse Creek Fire, which burned over 1 million acres in the Texas Panhandle into western Oklahoma. The fire was characterized by explosive fire behavior, and nearly all the fire growth occurred in the first 48-hours after ignition.

March 2024: Warm and dry conditions resulted in increased fire activity throughout the central Appalachians. Strong westerly winds and low relative humidity led to an outbreak of fires in western Virginia and the deployment of two Complex Incident Management Teams. By the end of March, the national year-to-date number of fires remained below average, but the cumulative acres burned was well above average at 350%, mainly due to the Smokehouse Creek Fire.

Quarter 3 (April 1 – June 30, 2024)

Table 4. FY2024 Quarter 3 (April 1-June 30, 2024) Fire Summary

Number of fires occurring over All Jurisdictions	Number of acres burned over All Jurisdictions	Number of fires occurring on National Forest System Lands	Number of acres burned on National Forest System Lands
5,283	1,668,694	970	74,128

April and May 2024: In April, significant fire activity peaked for the spring fire season in the Southern and Eastern states. On May 21, the National Preparedness Level (PL) was elevated to PL 2 based on steady but modest seasonal increase in fire activity. Wildfire activity remained low in much of the Southern states, with infrequent bursts of activity in Texas and Florida. Dry and windy conditions across the Southwest into the southern High Plains resulted in significant growth of the ongoing Blue 2 and Indios Fires in New Mexico, but significant fire activity overall remained minimal through May.

June 2024: On June 16, a dry northerly wind event in northern California resulted in several significant new fires. A dry lighting event during June 24 – 26 also resulted in several significant fires in the southern Sierra Nevada mountains of California. Both events illustrated the growth of abundant grass crops following the past two wet winters which had cured and were available to burn. The most significant event of the month was June 17, when a period of dry southwest winds across New Mexico resulted in the South Fork and Salt Fires that burned several hundred structures in and around the village of Ruidoso. On June 19 – 23, a sudden increase in moisture followed across New Mexico, rapidly replacing the wildfire threat with severe rain events resulting in several damaging debris flows from the burn scars. Alaska also observed a large increase in significant fire activity during the last ten days of June, with several large fires emerging across the Interior.

Quarter 4 (July 1- September 30, 2024)

Table 5. FY 2024 Quarter 4 (July 1-September 30, 2024) Fire Summary

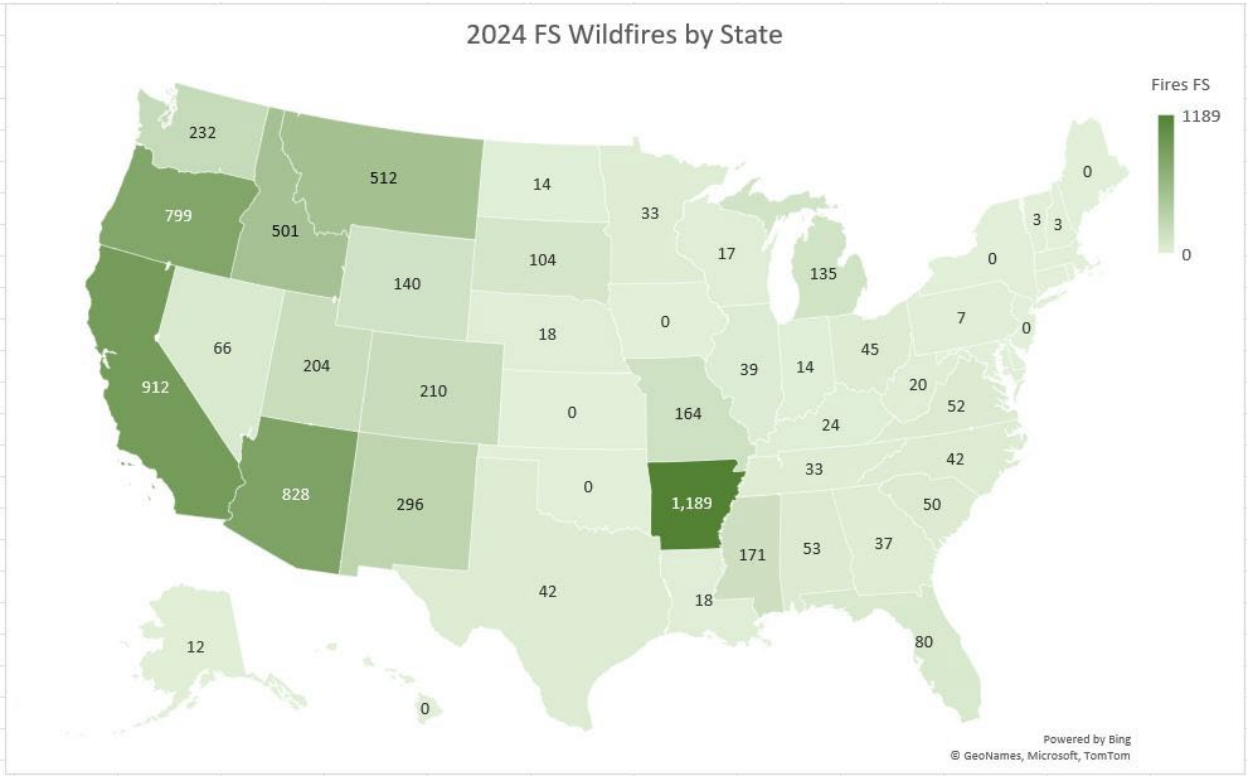
Number of fires occurring over All Jurisdictions	Number of acres burned over All Jurisdictions	Number of fires occurring on National Forest System Lands	Number of acres burned on National Forest System Lands
17,490	5,470,236	3,336	1,880,659

July 2024: An extreme heat wave resulted in several all-time high temperatures records, including 124°F in Palm Springs, California, 120°F in Las Vegas, Nevada, and 119°F in Redding, California. On July 10, the National Preparedness Level increased from PL 3 to PL 4, and then on July 18, to PL 5. Two significant dry lightning outbreaks during July 13-15 and July 21-23 produced dozens of new large fires in the Northwest, northern Great Basin, and Northern Rockies. The Wapiti Fire in central Idaho emerged during the second event. The Park Fire in northern California was discovered on July 24 and burned over 350,000 acres in the first 72 hours, while the Falls Fire in central Oregon produced pyrocumulonimbus clouds for several days. This dangerous weather phenomenon is a result of extreme burning conditions and explosive fire behavior and that puts firefighting personnel at great risk.

August 2024: After a third significant lightning outbreak (August 3-5) sparked numerous new fires, 245 active-duty soldiers from Joint Base Lewis McChord in Washington and over 70 firefighting personnel from Australia and New Zealand mobilized to bolster suppression efforts. Mid-August rain in the Northwest and the North American Monsoon in the Southwest reduced large fire activity, leading to a drop to PL 4 on August 22.

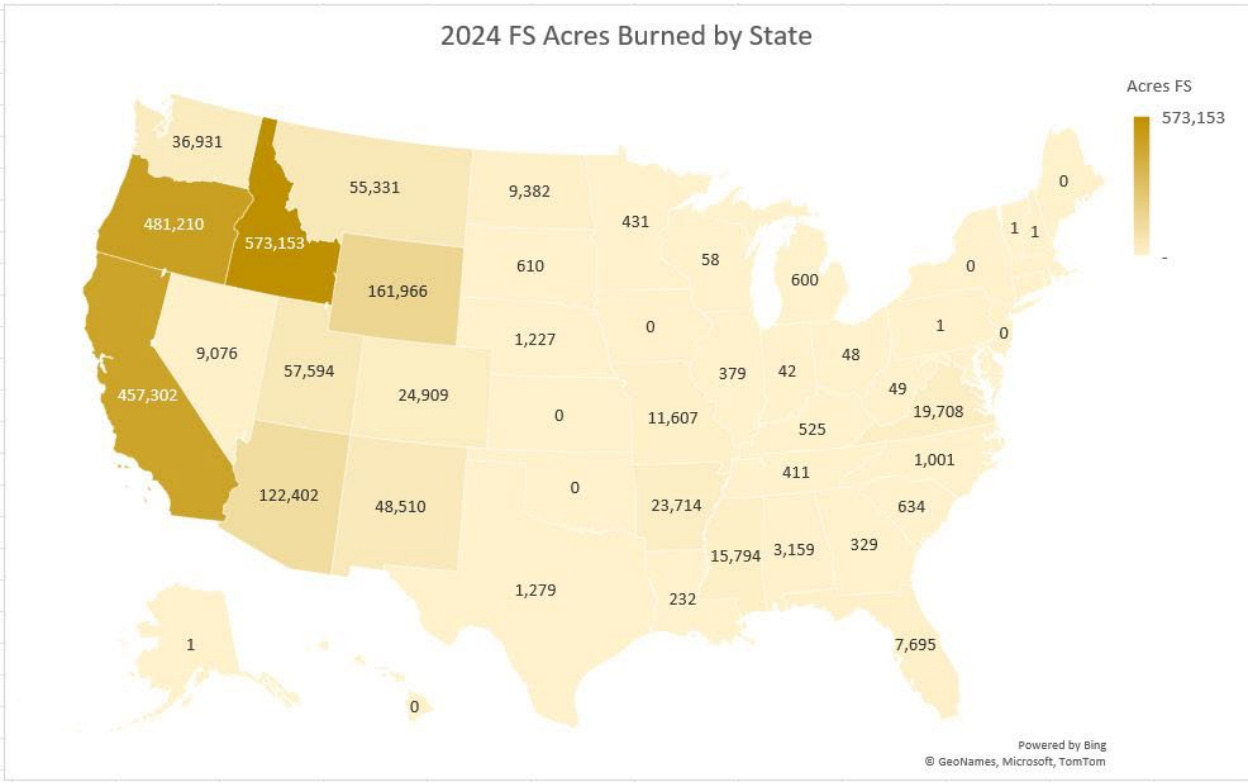
September 2024: Widespread dry lightning occurred again from September 1 – 3 resulting in another surge of significant fire activity across the Northwest. Extreme heat in southern California resulted in several large fires, including the Bridge Fire. These conditions prompted a rare increase back to PL 5 on September 6. A second seasonal rise to PL 5 had previously occurred only twice before – in August 2002 and August 2003.

Figure 2. Comparison of Forest Service wildfires by state for calendar year 2024[4]



4 Calendar year data does not reflect fiscal year totals. Source: National Interagency Coordination Center State Year-To-Date Activity Report

Figure 3. Comparison of Forest Service acres burned by state for calendar year 2024[5]



Military Support – Department of Defense

In 1975, the Departments of Agriculture and the Interior established an interagency agreement with the U.S. Department of Defense that is still maintained today. The interagency agreement allows for the provision of temporary support for critical surge capacity with aviation assets, ground forces, and infrared imagery products. Through the agreement, the National Multi-Agency Coordinating group has delegated authority to request assistance for military support from the Department of Defense. These requests vary from year to year depending on the need. All requests for assistance and reimbursements are conducted in accordance with the Economy Act of June 30, 1932, as amended (31 U.S.C. §§ 1535, 1536), the Federal Acquisition Regulations, and any other applicable laws and regulations, as appropriate.

In 2024, in response to the National Multi-Agency Coordinating group's request for one half military battalion of 245 soldiers, the Department of Defense provided the 14th Brigade Engineer Battalion and the 1st Battalion, 17th Infantry Regiment based out of Joint Base Lewis McChord in Washington. These resources deployed in Idaho in support of wildland fire operations on the Boise National Forest in the Great Basin Geographic Area.

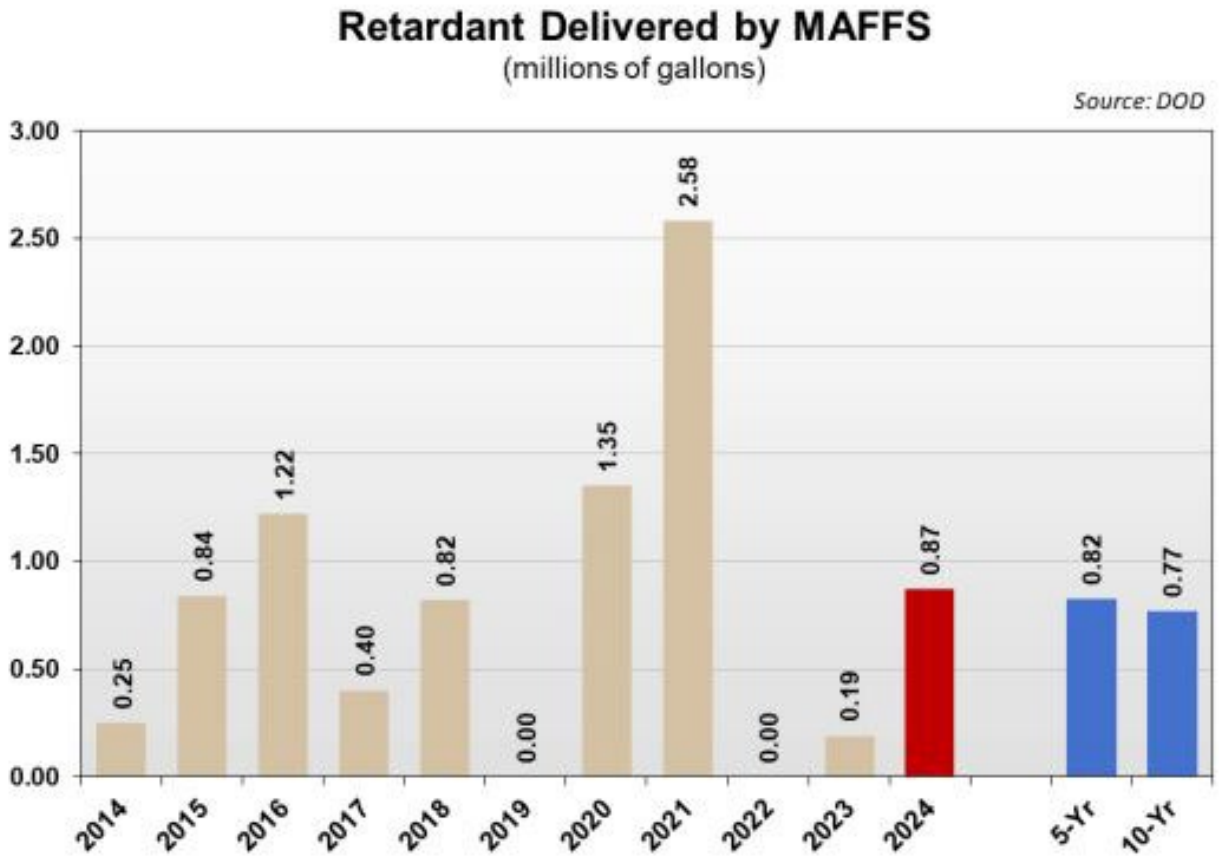
5 Calendar year data does not reflect fiscal year totals. Source: National Interagency Coordination Center State Year-To-Date Activity Report

Department of Defense Modular Airborne Firefighting Systems (MAFFS)

When all federally contracted large and very large airtankers are committed to wildfires or not readily available, the National Multi-Agency Coordinating group may request the Department of Defense C130's outfitted with Modular Airborne Firefighting Systems (MAFFS). Activation of these aircraft supplement fire suppression aviation needs across the nation. States may also activate MAFFS through state-to-state agreements.

In FY 2024, at the request of the National Multi-Agency Coordinating group, the Department of Defense provided six total C-130 MAFFS aircraft. These aircraft came from the 153rd Airlift Wing from Wyoming Air National Guard, the 302nd Airlift Wing from Colorado Air Force Reserve, the 146th Airlift Wing from California Air National Guard, and the 152nd Airlift Wing from Nevada Air National Guard. All aircraft operated from Port Hueneme, California. From July 14 to September 5, these aircrews provided aerial fire suppression support to fires in Southern California for 77 days. Over the course of 323 missions, the aircraft performed 315 retardant drops, delivering 871,205 gallons of retardant.

Figure 2. 10-year average retardant delivered by MAFFS as reported in National Interagency Coordination Center's Wildland Fire Summary and Statistics Annual Report 2024



FireGuard

The Department of Defense National Guard's FireGuard program provides constant, near-real-time satellite wildfire detection capability from military satellites in collaboration with the Forest Service, the National Interagency Fire Center, and the National Geospatial-Intelligence Agency's Firefly capability. FireGuard is used to detect wildfires, notify authorities, and create products to disseminate to firefighting networks nationwide. It provides a reliable data layer to fire managers and firefighters tool kits for incident awareness and assessment, filling in existing capability gaps including persistent monitoring and providing verification of new starts. Information and updates are provided via an online dashboard and the Enterprise Geospatial Portal. In FY 2024, 25,730 fireguard polygons on 2,551 fires were provided nationally.

International Support

During FY 2024, through international agreements, over 70 fire management personnel from Australia and New Zealand mobilized to the U.S. to assist with management of numerous wildfires across the West. The personnel arrived on August 14 and were primarily fire managers,

able to provide safety and fireline supervision consistent with U.S. wildland fire standards. Upon arrival they received a daylong orientation and situation briefing and were issued equipment. Their group assisted with various wildfires in the Pacific Northwest and returned home on September 11.

Methodology

Public Law 115–141 requires the Forest Service annually analyze a sample of large fires. The purposive sampling requirement of Public Law 115-141 provides a snapshot of fire management on specific incidents and should not be considered a comprehensive look at overall fire management across the system.

Fire managers must consider a wide range of factors for each incident including environmental conditions, risk management, collaborative management objectives with state, Tribal, local government, and private stakeholders, values associated with an incident, and resource availability and capabilities. These factors collectively influence incident management strategies and decisions which directly impact outcomes such as fire size and cost.

Table 6 Summarizes acres burned and associated costs for the fires selected for analysis arranged by start dates:

Fire Name	Fire Start Date	State	Geographic Area	Jurisdiction Origin	Final Size (acres)	Incident Costs (dollars)
Falls	July 10, 2024	OR	Northwest	Malheur National Forest	151,689	60,203,467
Wapiti	July 24, 2024	ID	Great Basin	Boise, Sawtooth, and Salmon-Challis National Forests	129,063	51,282,301
Bridge	Sept. 8, 2024	CA	South Operations	Angeles National Forest	56,030	28,885,414
Pack Trail	Sept. 15, 2024	WY	Rocky Mountain	Bridger-Teton and Shoshone National Forests	89,930	25,588,686
Elk	Sept. 27, 2024	WY	Rocky Mountain	Bighorn National Forest	98,352	32,994,054

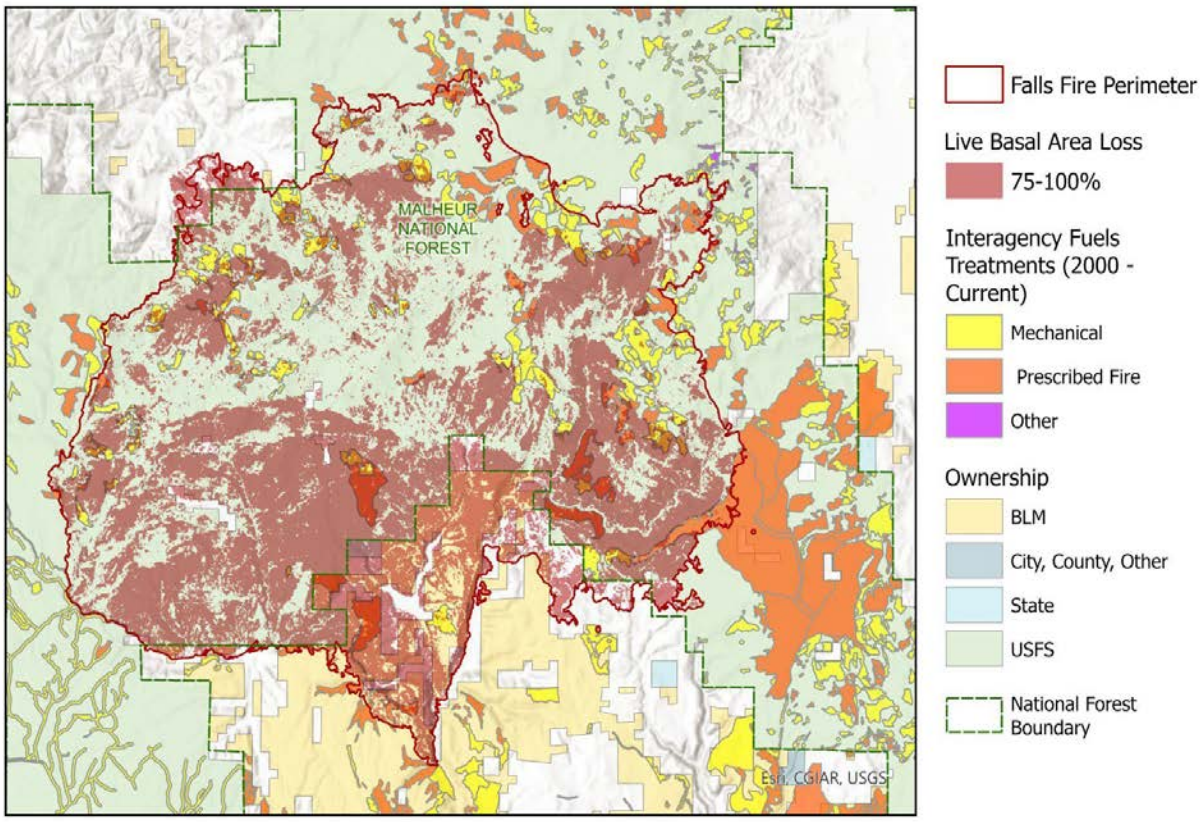
Summaries of Sampled Fires

Falls Fire, Oregon – July 10, 2024

The Falls Fire started 13 miles northwest of Burns, Oregon and burned 151,689 acres. The fire was identified as human-caused. Dry conditions and weather contributed to significant fire behavior. The Malheur National Forest issued an area closure on the Emigrant Creek Ranger District to protect public health and safety due to fire activity and fire suppression operations. This closure remained in effect through December 31, 2024. Post fire analysis concluded that

previously treated areas had less overstory mortality and burn severity compared to adjacent untreated burned areas, as illustrated in Figure 5 following.

Figure 5. Map overlaying fuels treatment projects and the Falls Fire Perimeter.



Wapiti Fire, Idaho – July 24, 2024

In the late evening, lightning started the Wapiti Fire on Boise National Forest, approximately 2 miles southwest of Grandjean, Idaho. Firefighter suppression efforts were challenged by steep terrain, difficult access, and unfavorable weather conditions. The fire eventually burned 129,063 acres across the Boise, Sawtooth, and Salmon-Challis National Forests.

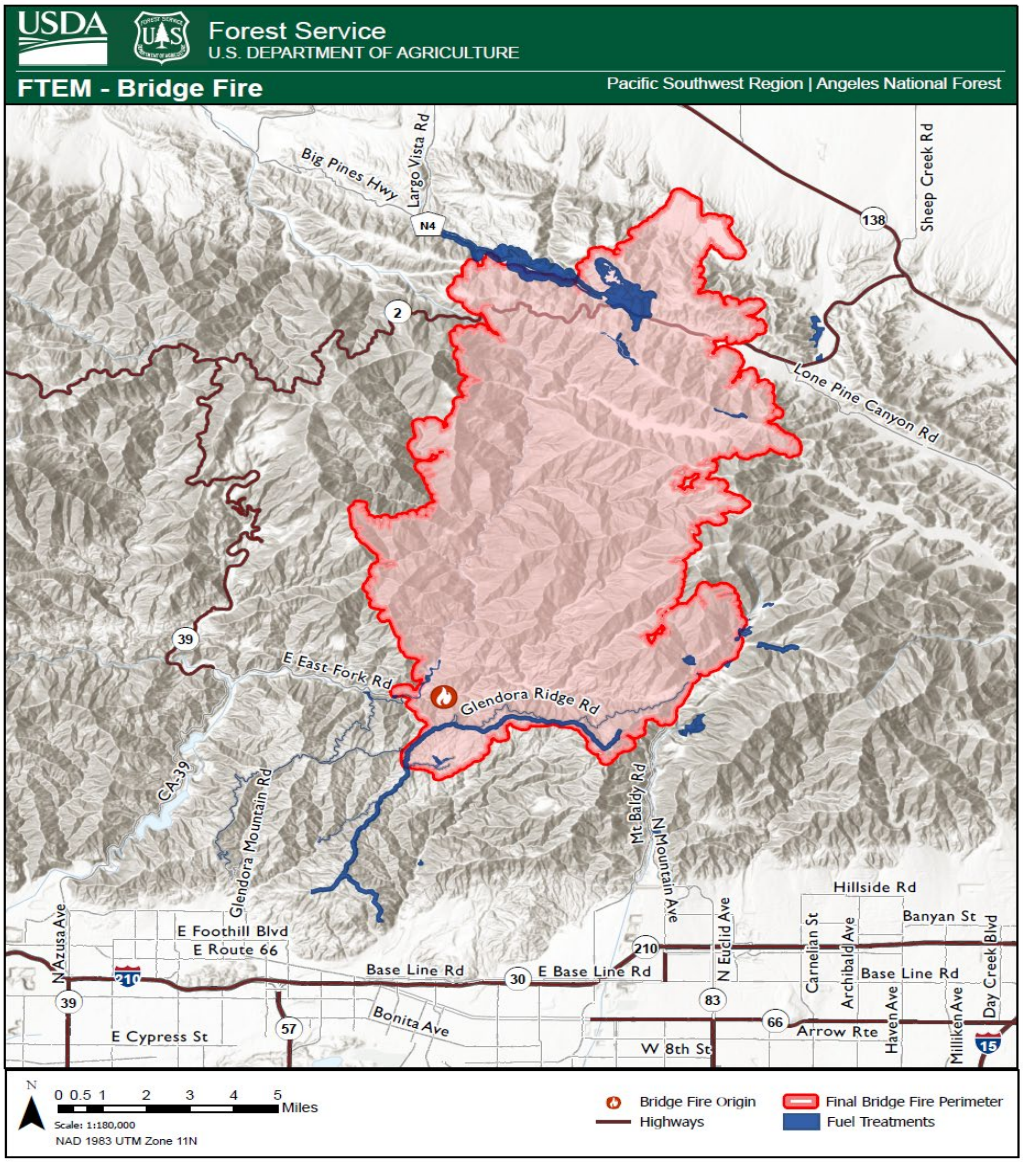
Bridge Fire, California – September 8, 2024

The Bridge Fire began east of the Angeles National Forest in Southern California burning 56,030 acres. It was the third-largest wildfire in California during FY 2024 injuring eight firefighters[6] and affecting 98 structures – destroying 81 and damaging 17 others. The cause of the fire is under investigation. Figure 6 below shows how the Bridge Fire interacted with multiple fuels reduction projects, attributed to successful suppression efforts to protect vital communications and

[6] Source: Bridge Fire Fuel Treatment Effectiveness Report, Angeles National Forest

electrical infrastructure, a National Aeronautics and Space Administration Jet Propulsion Laboratory facility, multiple historic structures, and numerous communities and businesses.

Figure 6. Map overlaying fuels treatment projects and the Bridge Fire Perimeter.



Pack Trail Fire, Wyoming – September 15, 2024

The lightning-caused Pack Trail Fire burned on both the Bridger-Teton and the Shoshone National Forests in Western Wyoming and was initially managed in conjunction with the earlier Fish Creek Fire. The fire burned 89,890 acres. Extreme wind conditions made early attempts to fight the fire with air resources and water drops unsuccessful. The fire ignited spot fires well ahead of itself, displaying fire behavior more in line with summer conditions rather than late

September. The wind created extreme fire behavior and, in a wind-driven run, pushed the fire five miles. On the night of October 4, the Pack Trail and Fish Creek Fires merged. On October 5, 60 mph winds caused another explosive fire growth event when the fire was pushed another seven miles. On October 13, winds calmed, and winter weather reduced fire activity.

Elk Fire, Wyoming – September 27, 2024

Lightning sparked the Elk Fire on the Bighorn National Forest, about 15 miles northwest of Dayton, Wyoming and illustrated the cooperative nature of wildland firefighting in the United States. The fire burned in federal, state, and county jurisdictions. Cooperative fire prevention projects provided opportunities for fire management successes, as the fire threatened as many as 3,000 homes at one point.

Risk Management

Strategic Analytics Branch

In Executive Order number 13976, dated January 14, 2021, President Donald J. Trump directed the development and adoption of new technologies to bring to bear cutting-edge management of the wildland fire program to improve the safety, efficiency, and effectiveness of suppression operations. In response, Forest Service Fire and Aviation Management launched the Strategic Analytics Branch[7] and worked with Regional Fire programs to fill Fire Analyst positions in every region. The Strategic Analytics Branch works towards the mission of providing the wildland fire community with analytics, strategic planning, and risk-informed decision support that improves firefighter and public safety, ecosystem resiliency, and management efficiency and effectiveness. The Strategic Analytics Branch and regional fire analysts boost the analytical horsepower of the agency to better inform decisions to manage and mitigate risks, improve and invest in technology research and development, deploy technologies in concert with the private sector, exchange lessons learned in training and monitoring capabilities, and share operational practices.

The Strategic Analytics Branch maintains a set of tools including spatial data layers of Potential Control Location Suitability, Suppression Difficulty Index, Snag Hazard, and Firefighter Ground Evacuation Time, to encourage consideration of firefighting effectiveness, efficiency, and safety when preparing for and responding to fires. They also provide leadership and data management support for the development, maintenance, and application of Potential Operational Delineations (PODS)[8] mapping to encourage proactive identification of potential fire control features and pre-planning to inform effective, efficient, and safe responses. These and other

[7] https://experience.arcgis.com/experience/f5ca19164c1d4ec9bd4e221611508d28
[8] https://research.fs.usda.gov/rmrs/projects/pods

decision support tools are made available to the entire wildland fire community through the Risk Management Assistance Dashboard[9]. The dashboard uses a combination of interactive maps, data dashboards, and web applications to inform decisions during wildfire response related to firefighter safety and risks to life, property, and natural resources.

Risk Factors and Strategic Decision Making in FY 2024 Wildfire Suppression Operations

The set of considerations that affect decisions on suppression objectives and approaches may shift in response to changing fire conditions. Fire managers must balance operational decisions that consider exposure (safety) of fire personnel, protection of life, property, and infrastructure, landscape management objectives, cost versus efficacy, and the impacts of suppression actions. A broad range of risk assessment tools support strategic and operational decision making, including the Relative Risk Assessment within the Wildland Fire Decision Support System (WFDSS)[10] and operational risk assessments within Incident Action Plans. WFDSS is the system of record for analysis and final decisions and assists fire managers and agency administrators in making strategic, tactical, risk-based decisions for wildfire incidents using a deliberative risk analysis process. Three risk components are analyzed:

- **Values:** Resources (e.g., social, cultural, economic, or ecological) that could be lost or damaged because of a fire.
- **Hazard:** The intensity, severity, and spatial extent of the fire, influenced by the physical conditions of the fire environment.
- **Probability:** The likelihood of the fire affecting values.

This review confirmed commonalities between these fires, including challenging terrain, difficult access, concerns for firefighter and public safety, threats to public and private infrastructure, need to involve multiple stakeholders (Federal, Tribal, state, county, local and/or private), socioeconomic concerns and potential damage to or loss of natural and cultural values. Other common factors existed between incidents but were not noted as shaping fire response; for example, many of these fires impacted habitat for threatened, endangered, or otherwise sensitive species, but such habitat was not cited as a decision-making factor for every fire.

Personnel on the fires reviewed in this report used information available through the Risk Management Assessment dashboard. This dashboard currently provides analytics to inform the Incident Strategic Alignment Process[11] including the Fire Intelligence Matrix, Fire Comparison Dashboard, PODs, Potential Control Location Suitability[12], and Aviation Use Summaries, as

[9] https://experience.arcgis.com/experience/f9d7f7f920494c3db43a23a8dffe4664?org=nifc
[10] https://wfdss.usgs.gov/wfdss/WFDSS_About.shtml
[11] https://storymaps.arcgis.com/stories/7e0b757bc6a4480cad008218d6448212
[12] https://www.arcgis.com/home/item.html?id=c83484a8f54d4212a453cbec8f461491

outlined in the following examples. Additional tools within the Risk Management Assistance Dashboard include Geographic Information System data, the Suppression Difficulty Index, and data, charts, and tables that enable informed consideration of fire danger, snag hazards, estimated ground evacuation for injured firefighters, severe fire weather, fire progression and history, assessment of proposed containment lines, smoke production and dispersion, and historical probability of season-ending weather events.

Table 7. Common and unique factors analyzed during the management of FY 2024 sampled fires

Incident	Unique Factors	Common Factors
Falls Fire	Occurred early in fire season; unmaintained roads hampered early response	• Hazards to firefighters • Hazards to public safety (closures, evacuations) • Difficult terrain/access for ground resources • High reliance on aerial resources • Threats to infrastructure • Threats to multiple ownerships • Threats to natural/cultural resources • Smoke concerns for communities and transportation • Socioeconomic impacts • Transportation disruptions • Resource limitations (regional and/or national) • Extreme fire growth event(s)
Wapiti Fire	Middle of fire season; Incident Management Team managing multiple fires	
Bridge Fire	Middle of Southern California fire season; prompt recognition that fire could become large and impact distant values; proximity to Los Angeles	
Pack Trail Fire	Late in fire season; merged with earlier Fish Creek Fire; use of confine and point / zone protection strategies	
Elk Fire	Late in fire season; fatigue from persistent local fire activity	

Figures 7 – 11 below illustrate risk factors and strategic decisions during the sampled fires.

Figure 7. Timeline of Falls Fire

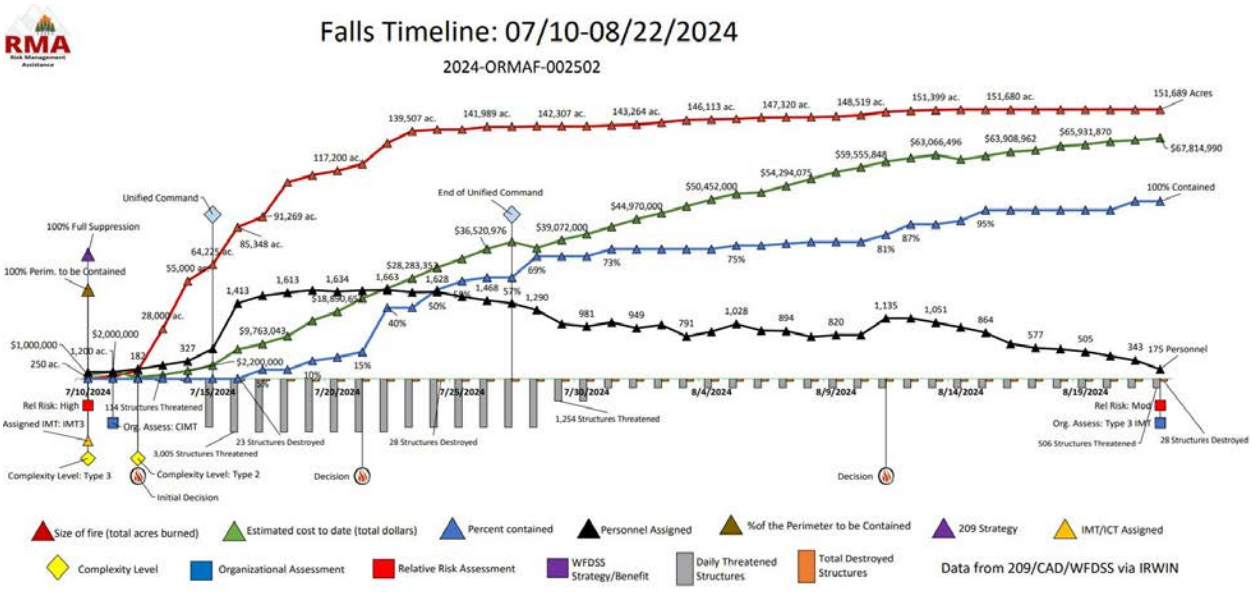


Figure 8. Timeline of Wapiti Fire

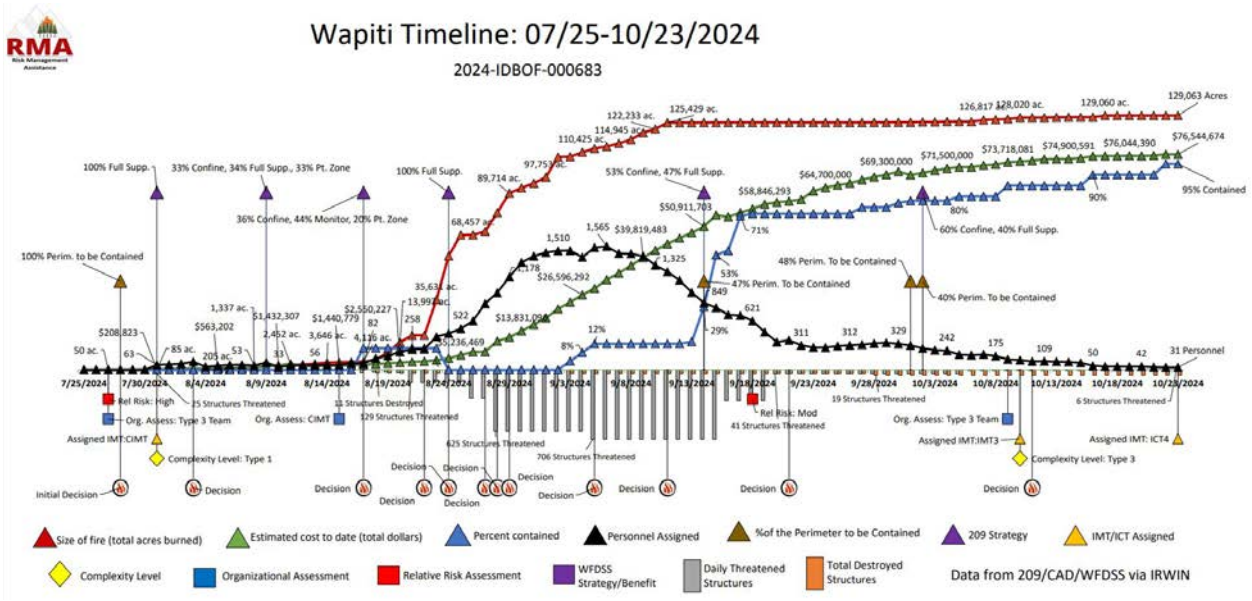


Figure 9. Timeline of Bridge Fire

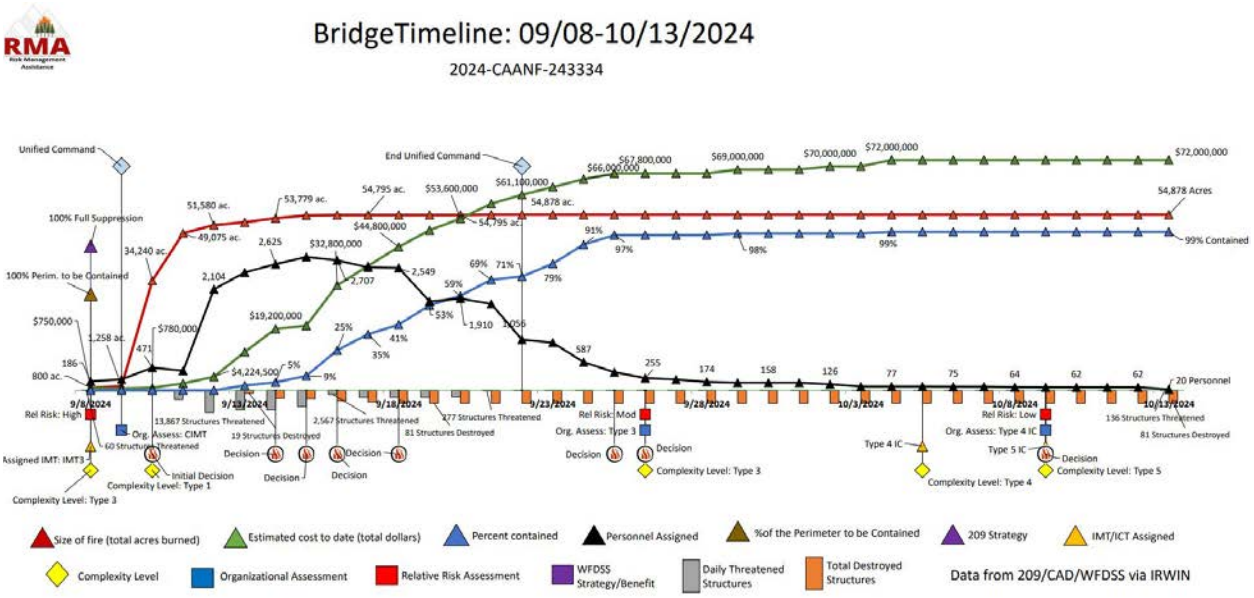


Figure 10. Timeline of Pack Trail Fire

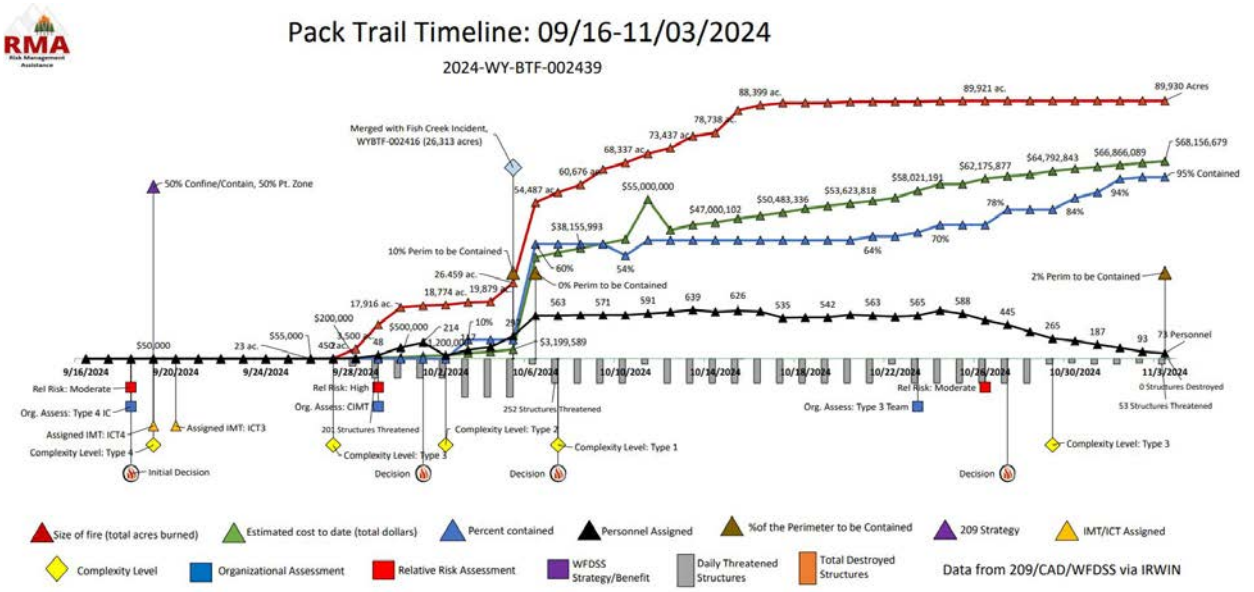
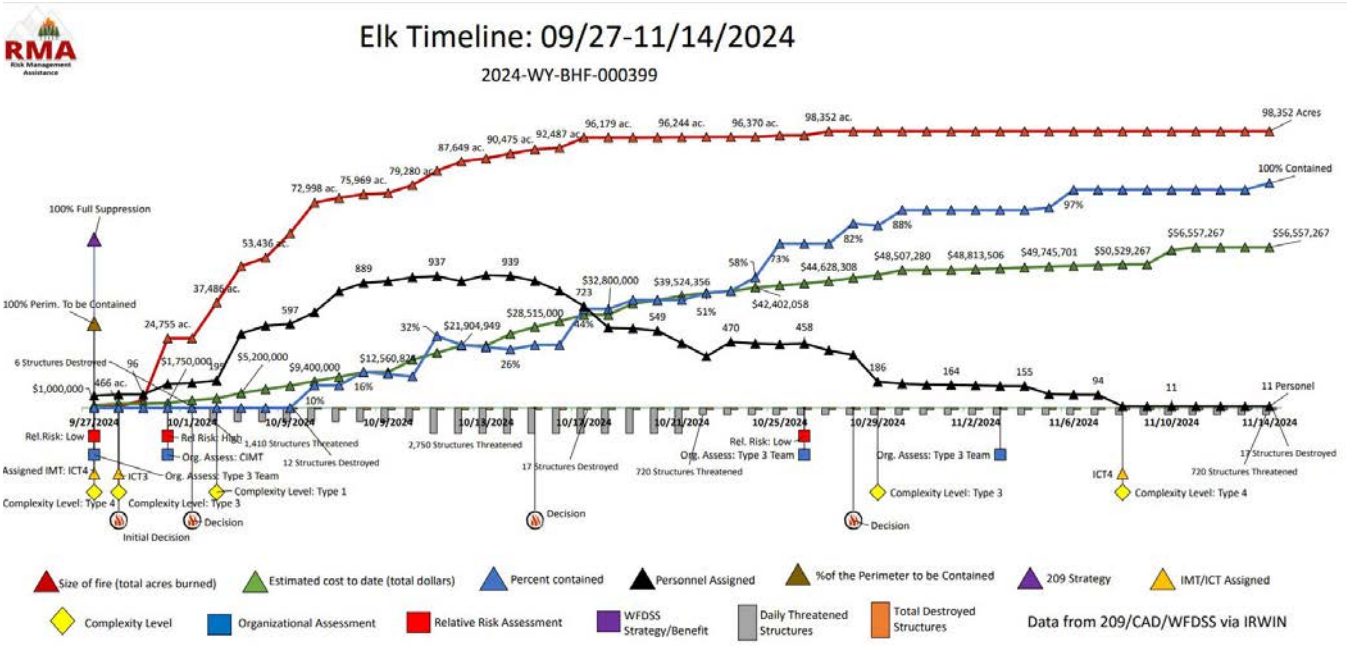


Figure 11. Timeline of Elk Fire



Incident Strategic Alignment Process (ISAP)

The Incident Strategic Alignment Process was used on all reviewed fires. This process provides comprehensive risk information to support decision makers in a condensed time frame, using the best available science combined with the collective knowledge and experiences of Incident Management Teams, subject matter experts, and agency administrators. Ongoing risk-based conversations between stakeholders, partners, and Incident Management Teams are key to a common understanding of objectives, the probability of success, and the evolution of risk throughout the lifecycle of a fire. These assessments and conversations are based on the four foundational pillars of the Incident Strategic Alignment Process:

- **Critical Values at Risk:** Specific threatened critical values are identified and rated by host Agency Administrator(s) to inform suppression actions.
- **Strategy & Strategic Actions:** Strategies are developed and divided into 2-5 strategic actions that address the unique incident needs.
- **Risks to Responders:** Six risk influencers of common denominator wildland fire injuries are considered for each portion of the strategy.
- **Probability of Success:** Defining success and understanding challenges and opportunities are a key component of informing the risk discussion.

Fire Analytics

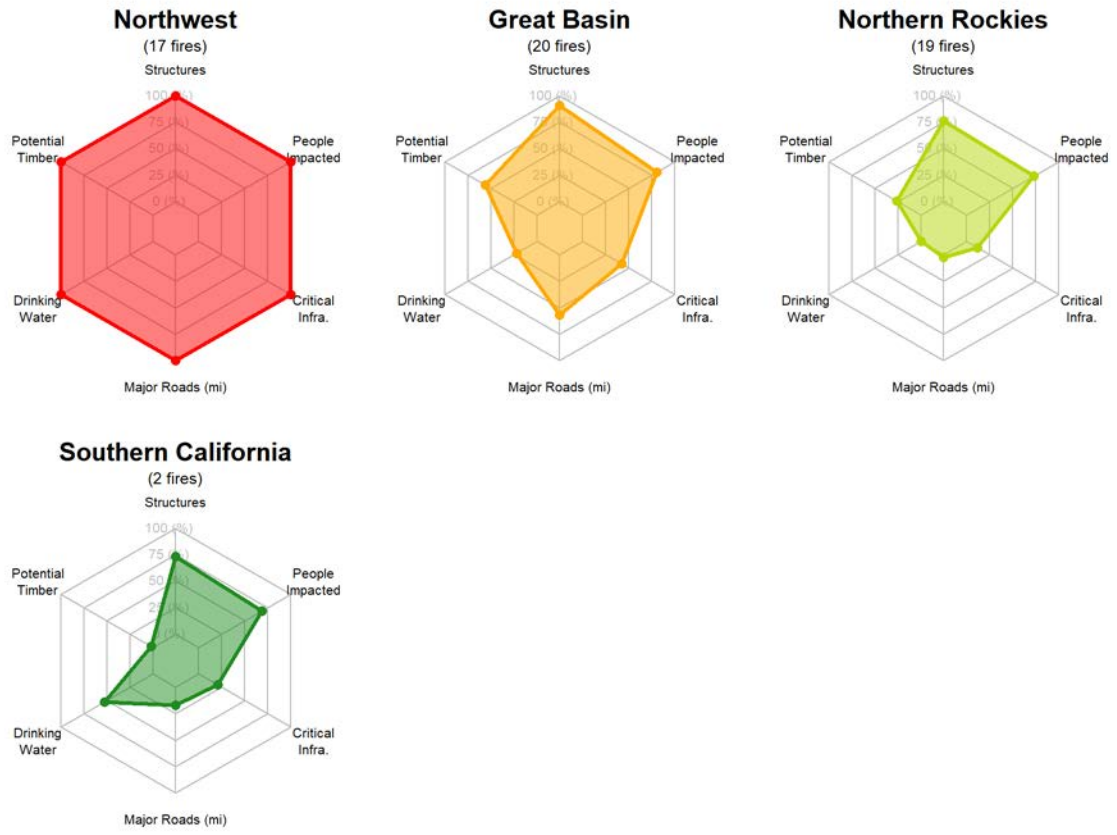
Incident Management Teams use data-driven strategic decision support to better manage expectations for firefighters to protect the public, communities, and natural and cultural

resources, and constrain growth in wildfire suppression costs. Area Command Teams, Geographic Area Coordination Centers, and national and regional Multi-agency Coordinating groups also reference analytics to help inform resource allocations. These ongoing improvements are expanding interagency focus and producing better decisions during fire suppression and other emergency incident management events.

Forest Service's Washington Office Fire and Aviation Management Strategic Analytics Branch supports local, regional, and national leadership, incident management teams, and national and geographic coordination centers with the prioritization of scarce resources to multiple competing fires. This difficult task is accomplished through the development and use of two analytics: the Fires Intelligence Matrix and the Fires Comparison Dashboard. Both products use all-lands, risk assessment and mapping data of highly valued resources and assets such as homes and businesses, population density, critical infrastructure, municipal drinking water, and commercial timber, combined with weather information.

The Fires Intelligence Matrix provides a buffered fire perimeter, and the Fires Comparison Dashboard demonstrates predicted wildfire growth for seven (7) or fourteen (14) days. For example, Figure 12 is a radar chart by geographic area that is shared with National Interagency Coordination Center and National Multi-Agency Coordinating Group to show the potential for exposure over the next 7 days based on fire modeling, weather, topography, and values-at-risk.

Figure 12. Potential losses by geographic area from 58 large fires across the U.S. from September 6-12, 2024.

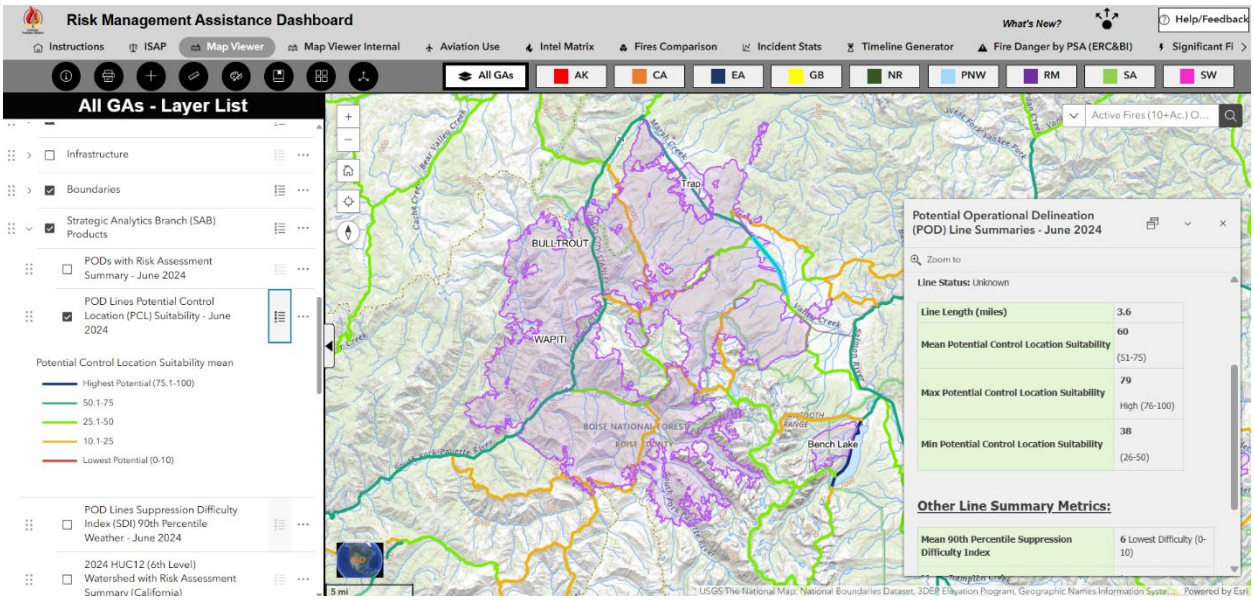


Potential Operational Delineations (PODs)

Potential Operational Delineations (PODS)[13] are fire planning units bound by potential control features like roads, ridges, rivers, previous burned areas, and fuels management projects. The Forest Service has invested in PODs planning the last decade to build a common operating picture with partnering agencies and the public about local fire management risks, challenges, and opportunities that inform how the Agency and partners prepare for and respond to fires in different parts of the landscape. By June of 2024, PODs were developed or in process for over 80 fire-prone forests in the Western U.S. The Strategic Analytics Branch enhances the PODs data developed and maintained at the local level by creating nationally consistent spatial decision support products like inventories of values at risk within PODs areas and maps of the operational relevant PODs boundaries with effectiveness, efficiency, and safety attributes. See Figure 13 below for an example of a pre-fire analysis map.

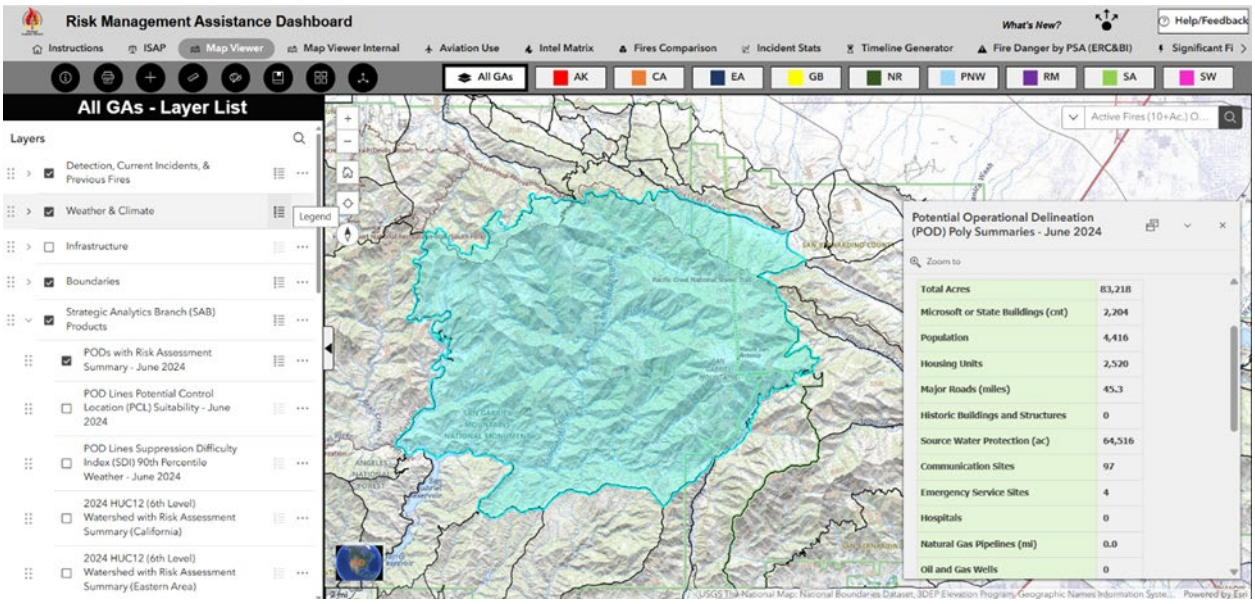
[13] https://research.fs.usda.gov/rmrs/projects/pods

Figure 13. Example of pre-fire analysis to map the operationally relevant POD boundaries and assign them effectiveness, efficiency, and safety attributes.



The investment in PODs pre-planning has several benefits. The local unit can often use the POD of origin or a cluster of PODs as the initial planning area for a fire response. Pre-fire inventories of values at risk can quickly and accurately inform the relative risk and organizational assessments to right size the fire response. PODs can also serve as a tool to transfer local knowledge to the Incident Management Team. PODs boundaries are often referenced by planning and operations sections to quickly get a handle on the opportunities for indirect control tactics should the current or anticipated fire behavior necessitate them. Some POD lines may even be prepared for use in fire suppression from pre-fire fuel treatment work, further reducing the need for containment line construction or improvement. The following POD inventory of the Angeles National Forest was conducted prior to the Bridge Fire. The large area of the POD indicates the landscape has few high probability control features, due to rugged terrain and lack of road access.

Figure 14. Example of pre-fire POD inventory for the area burned by the Bridge Fire on the Angeles National Forest.



All five of the study fires interacted with PODs networks. The magnitude of interaction and potential impacts on suppression effort were quantified by calculating the length of the final fire perimeter that fell within a quarter mile of the pre-identified PODs boundaries representing potential control features as illustrated in the following table. On average, 22% of the total perimeter length of the study fires aligned with PODs boundaries. The Bridge and Falls Fires both had more than a third of their final perimeters aligned with PODs boundaries. Intentional use of these pre-identified features likely improved the efficiency of operations. Reports from the Elk Fire indicate that additional PODs boundaries were identified and prepped as contingency lines that did not interact with the fire due to improved weather that reduced fire behavior.

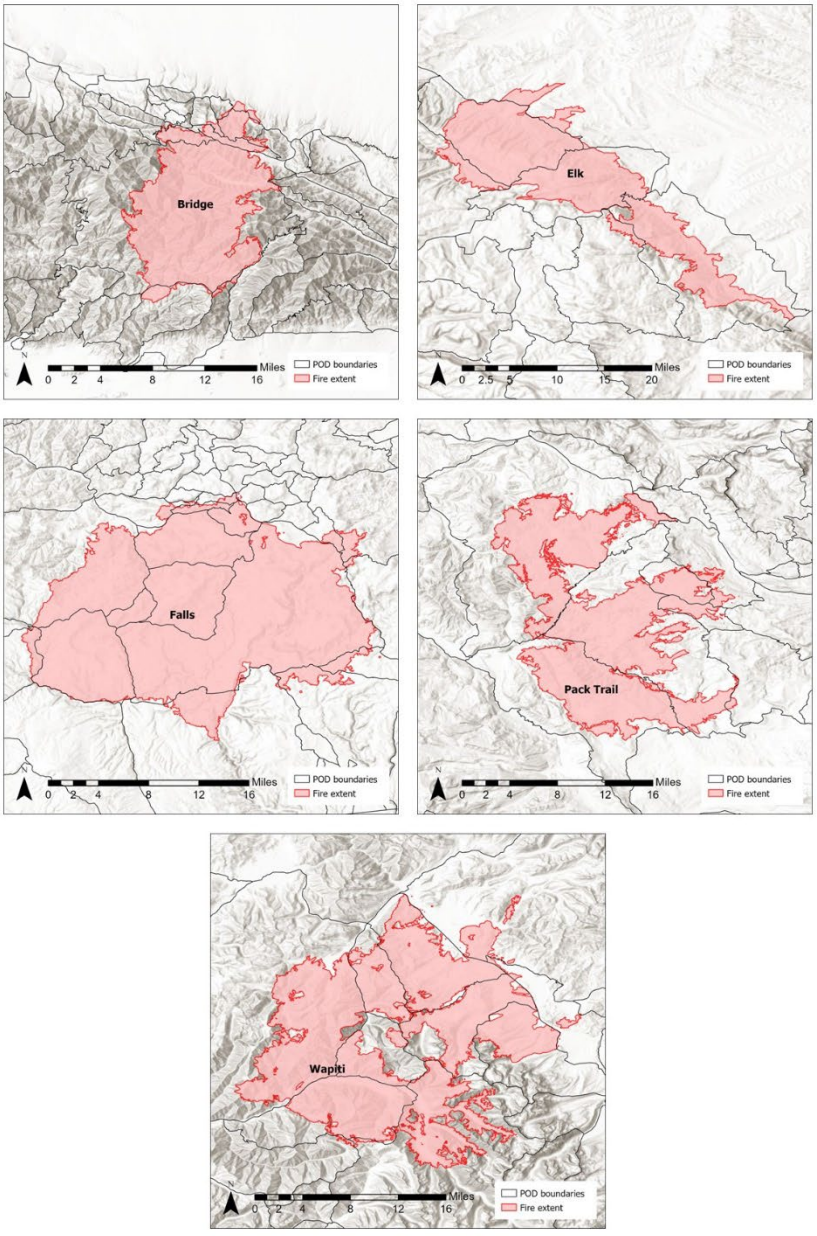
Table 8. Alignment of total fire perimeter length with PODs for sampled fires

Fire	Perimeter length (mi)	Length aligned with PODs (mi)	Length aligned with PODs (%)
Falls	154.9	60.1	38.8
Wapiti	462.6	101.2	21.9
Bridge	120.6	43.6	36.1
Pack Trail	413.2	58.7	14.2
Elk	177.2	28.3	16.0
Total	**1,328.5**	**291.8**	**22.0**

The final fire extents relative to the PODs illustrate the magnitude of alignment, seen in Figure 15 below. Note that focus on more expensive fires for this cost review biased these examples towards larger fires

with extreme behaviors that challenged suppression including at some POD lines. There are many cases in which fires are contained to the POD(s) of origin or adjoining POD boundaries.[14]

Figure 15. Final sampled fire perimeters relative to PODs.



[14] Additional information can be found at the Strategic Analytics Branch Recent Products page https://arcg.is/1S4eK90

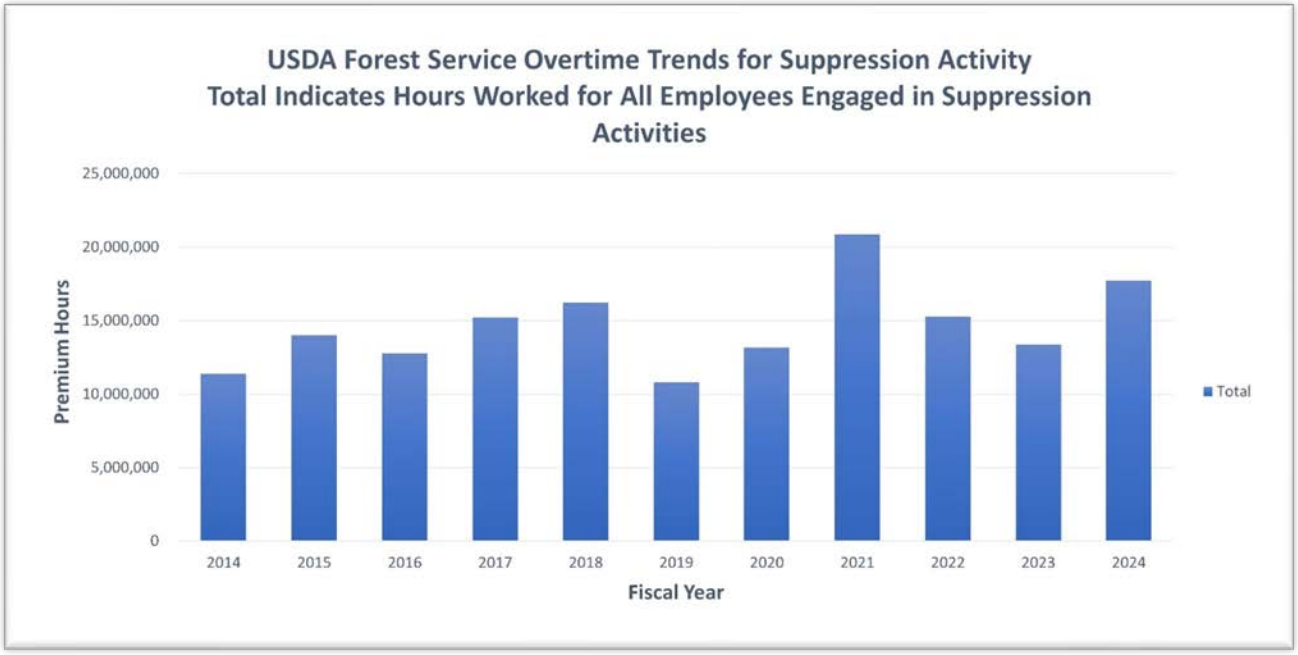
Firefighter Exposure

Risk to firefighters is an integral part of fire management decision-making. Managers often face complicated choices of how much risk to accept to meet fire objectives, including the protection of identified values at risk. Factors influencing the acceptance of risk include the presence and type of hazards, probability of success, and the resilience of the system to respond to a "bad event." During all these fires, managers frequently conducted risk assessments to ensure that the potential benefits of suppression actions were worth the risk to firefighters. In some cases, decisions to decrease firefighter risk came at the expense of increased fire costs.

The Forest Service continues to make targeted strategic investments to improve the quality of its decisions. For example, the agency provides training in strategic risk and decision making through its Senior Leader Program and Line Officer Academy to help future decision makers learn critical concepts and best practices in wildland fire response. Further, significant effort has been made over the last several years by both the Forest Service and the Department of the Interior to improve risk management strategies, wildfire response planning, and fire analytics that address suppression difficulty and probability of control. These strategies continued to play an integral part in decision-making for the reviewed fires with a focus on reducing firefighter risk.

Figure 16 below reflects the increasing workload and overtime for Forest Service personnel engaged in fire suppression activities over the past decade by fiscal year. An extremely high workload can contribute to higher attrition rates, increased mental health issues, and other impacts. The Forest Service continues to develop long term solutions, collaborating with the Department of the Interior, the Office of Personnel Management, and other agencies, focusing on workforce initiatives.

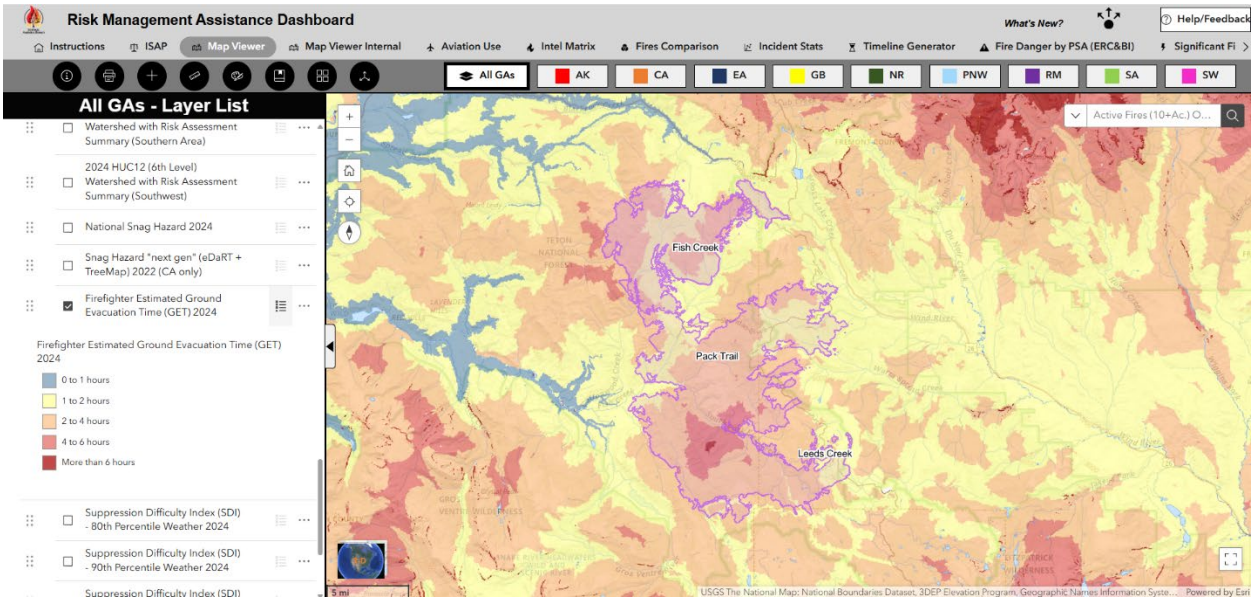
Figure 16. Overtime Trends for Suppression Activity



The Strategic Analytics Branch led an effort to update the Firefighter Estimated Ground Evacuation Time Layer featured in the Wildland Fire Decision Support System (WFDSS)[15] and the Risk Management Assistance Dashboard. The first version from 2013 was inspired by the tragic story of a National Park Service firefighter, Andy Palmer, who died from a tree strike injury during a lengthy evacuation.[16] The Ground Evacuation Time layer was created in the wake of this incident to increase awareness of evacuation challenges so that firefighter safety is better accounted for in fire management decisions. The layer's Ground Evacuation Time estimates are meant to complement but not replace incident-level safety and medical planning by providing a broad, visual depiction of travel times to the nearest hospital capable of stabilizing patients with serious injuries. The Strategic Analytics Branch worked with firefighter safety and mobility experts at the University of Utah Remote Sensing Applications Lab[17] to update the Ground Evacuation Time layer with the latest spatial data and mobility science. The effort was also guided by an interagency group of risk, safety, and decision support subject matter experts. Full details are available in this publicly accessible article[18]. Figure 17 below is a sample of the Ground Evacuation Time Layer used during the Pack Trail Fire strategic planning process. Information such as this makes it possible to develop containment options while minimizing risk to responders and to identify situations that require mitigating actions before committing resources.

[15] https://wfdss.usgs.gov/wfdss/WFDSS_About.shtml
[16] https://www.nps.gov/articles/remembering-andy-palmer-nps-wildland-firefighter.htm
[17] https://ursa.utah.edu/
[18] https://www.mdpi.com/2571-6255/7/8/292

Figure 17. Firefighter Estimated Ground Evacuation time map for the landscape surrounding the Pack Trail Fire showing that portions of the fire were very inaccessible and would create challenges for timely evacuation of injured firefighters. [19]



Landscape Restoration

A century of wildland fire research has shown that low-intensity fire reduces fuels across landscapes, slows large wildfires, and diminishes fire severity. Likewise, fuels mitigation treatments reduce wildfire risk to public safety, firefighters, property, and infrastructure. Experience across the sampled fires reflected the findings from this prior research. However, some studied fires demonstrated the limitation of fuel treatments when faced with extreme fire behavior.

For example, during the Falls Fire, one fuels treatment unit sustained significant post-fire tree mortality when extreme weather conditions aligned with topography resulting in wildfire "raging out of the canyon," burning from treetop to treetop. Had fire entered the canyon during moderate weather conditions, the tree mortality could have been minimal, but this canyon was impacted on the third day of an extreme weather event. Despite extreme fire behavior, the convective heat required to sustain a "crown fire" in the treetops diminished as the fire burned

19 Source: RMA Dashboard
Stratton, Richard D.; Miller, Lauren B.; Gannon, Benjamin. 2021. Risk Management Assistance Dashboard. USDA Forest Service, National Headquarters, Fire and Aviation Management.
https://experience.arcgis.com/experience/f9d7f7f920494c3db43a23a8dffe4664?org=nif

through the treated surface fuels and the fire dropped to the ground, creating significantly safer firefighting conditions.

Where fuel treatments were in the right places under the right circumstances, they aided in suppression and reduced firefighter risk. However, fuel treatments have never approached the pace and scale of the work needed on the land. Additionally, the challenge of coordinating funding and capacity to do the work with partners across landownership boundaries can limit fuels treatments implementation on a landscape scale.

The Forest Service has made substantial investments in the Fuels Treatment Effectiveness Monitoring[20] which assesses the effectiveness of fuels treatments with wildfire interactions. Thorough analysis of these interactions takes time to complete.

As of December 31, 2024, assessments were completed on more than 631 interactions between fuels treatments and calendar year 2024 wildfires, with 4,814 potential interactions identified. Assessments indicate that in 2024 when a wildfire interacted with fuels treatment, it changed the fire behavior 77% of the time and that fuels treatments helped with control and/or management of wildfires 70% of the time. Five-year averages across more than 9,773 monitored interactions show that fire behavior moderated 73% of the time when fire interacted with fuel treatments and that fuel treatments helped with control and/or fire management 62% of the time.

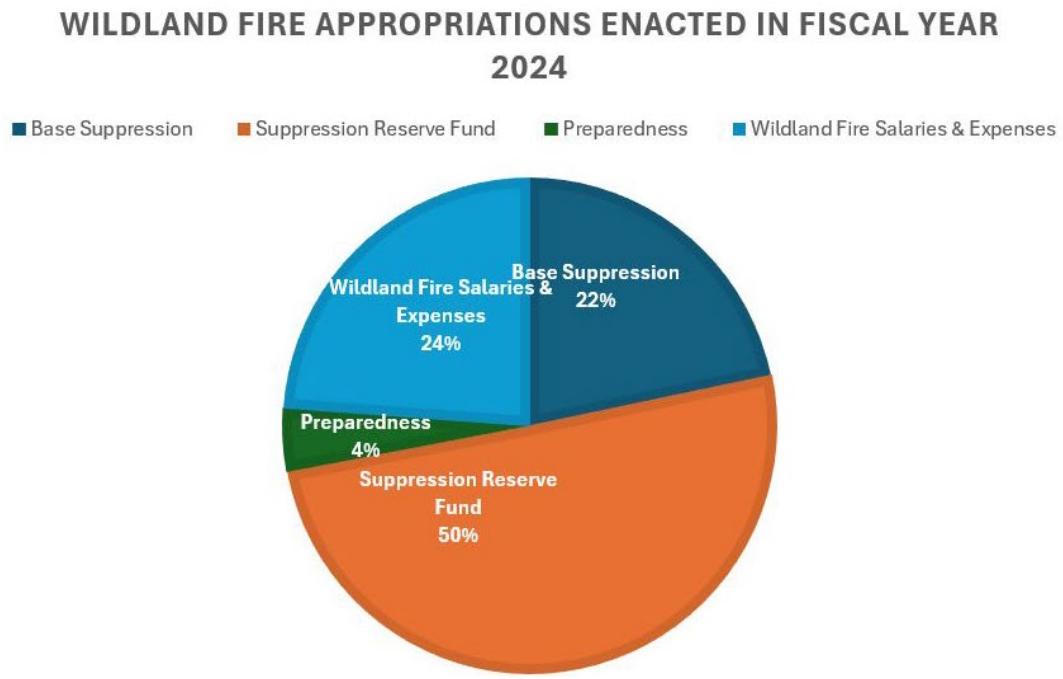
Financial Management

Total Wildland Fire Management Costs

Forest Service Wildland Fire Management appropriations include Salary and Expense, Preparedness, and Suppression funds, outlined in Figure 18 below. The agency also receives funding through other appropriations outside of the Wildland Fire Management portfolio that benefit overall fire mitigation, such Hazardous Fuels Management. This report has not detailed other appropriations such as Hazardous Fuels Management, Joint Fire Science, or Infrastructure Investment and Jobs Act (Public Law 117-58) that fall outside of reporting requirements described in Division O of Public Law 115–141 (132 Stat. 1061).

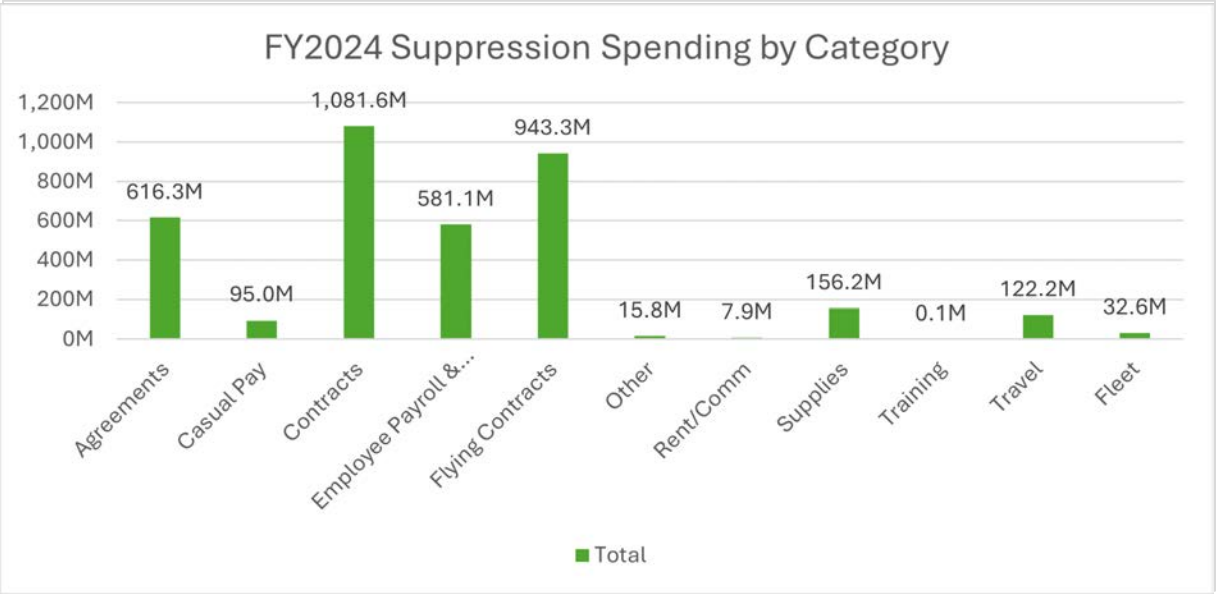
[20] https://iftdss.firenet.gov/firenetHelp/help/pageHelp/content/10-ftem/ftemabout.htm

Figure 18. Wildland fire appropriations enacted in FY2024



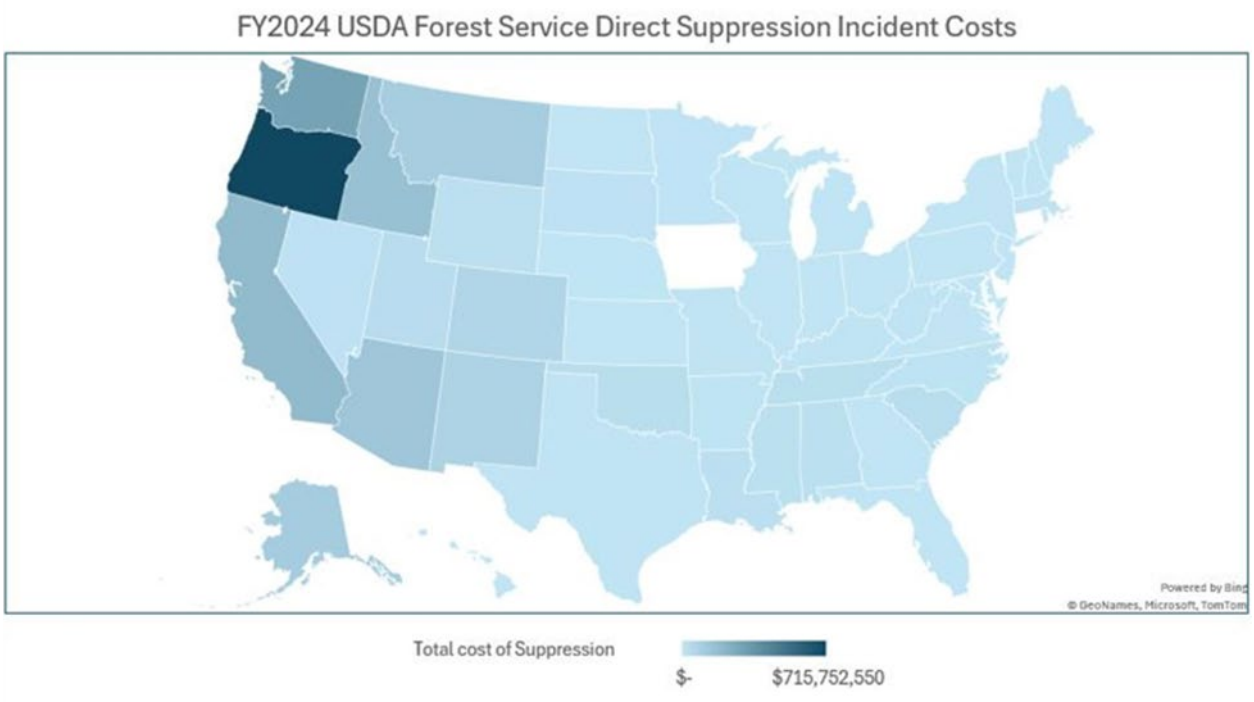
Forest Service fire suppression expenditures in FY 2024 totaled nearly $3.7 billion. Total expenditures include direct wildfire incident activities and non-incident-specific wildfire support activities such as exclusive use aviation contract availability. Wildfire activity across the nation was heightened in FY 2024 resulting in an increase of resource ordering and costs in all cost categories. In ground logistics contracts the primary cost driver was contracted crews. This cost increase was primarily due to a revision in wage determination (Wage Determination No.1995-0221 Revision No.62) for contracted wildland firefighters, significantly impacting the contract rate for crews. Aviation contracts also realized an increase as a result of extended exclusive use availably late in the fiscal year while in preparedness level 5 and increased flight time and use of call when needed (CWN) support for ongoing high activity throughout the fiscal year. Employee payroll and benefits include standard employee pay and benefits for the ready reserve workforce engaged in fire suppression and employee pay premiums such as hazard pay and overtime for all employees engaged in fire suppression activities. Note that wildfire incidents occasionally span FYs, and further, costs associated with such a wildfire may take multiple FYs to resolve cost-share agreements, cost-recovery efforts, and invoice submissions.

Figure 19. FY2024 suppression spending by category



The western United States realized the largest share of expenditures related to fire suppression. As identified in Figure 20 below, Oregon saw the highest expenditures for direct incident costs. Costs represented in the map do not include expenditures that are in support of fire suppression, including regional resource adjustments, regional and national fire support, or severity coded activities (used to move and support resources and personnel when specific conditions indicate an unusually high risk of wildfire).

Figure 20. FY 2024 Forest Service Direct Suppression Incident Costs for Large Fires[21]



Summary of Costs Associated with Sampled Fires

Costs associated with any given fire are driven by fire conditions and resource decisions with a focus on suppression objectives while minimizing exposure and risk. Fifty percent of total spending for large fires sampled in FY 2024 was for contracting ground-based resources and retardant, and agreements for partner personnel and resource contributions. Aviation costs represented 13% of spending on the sampled fires. Forest Service strives to maximize cost benefits in suppression response through thoughtful fire preparedness efforts, such as pre-planning workshops with partners and stakeholders, risk management analyses, and fuels treatment planning, implementation, and maintenance.

21 State spending data indicates only spending as of September 30, 2024 on large fires with a unique fire code in each state of origin.

Table 9. Summary of costs associated with FY2024 sampled fires

INCIDENT NAME	AVIATION (EXCLUDING AVAILABILITY COSTS)[A]	CASUAL PAY	CONTRACTS, AGREEMENTS, & FLEET)[B]	PERSONNEL COMPENSATION	SUPPLIES, MATERIALS, & TRANSPORTATION OF THINGS	TRAVEL
Falls	6%	2%	78%	9%	5%	1%
Wapiti	11%	2%	64%	20%	1%	2%
Bridge	17%	3%	41%	28%	7%	3%
Pack Trail	12%	2%	66%	16%	1%	3%
Elk	25%	1%	55%	16%	1%	2%

A Aviation for specific incidents only includes flight time on all aircraft while all availability for aircraft is funded at the national level.

B Contracts include all contracted ground resources and retardant costs.

Lessons Learned and Recommended Enhancements

Risk Management

Strategic Risk Assessments enhance decision-making both before and during wildfires. Risk Management Assessment products have proven to be fiscally prudent land management tools and agency practitioners have identified opportunities for product and model improvements. The Forest Service recommends continuing to invest in risk-based analytics to inform better decision making and optimized resource use.

Fire Management

The Forest Service continues to modernize its wildland fire position descriptions and position management strategy. The Agency is committed to this work, which will be an ongoing effort for FY 2025 and beyond.

Landscape Restoration

Observations during FY 2024 confirm that under the right conditions, fuel treatments and prior wildfire scars (footprints) can alter fire behavior and provide opportunities to achieve suppression objectives with less cost and firefighter exposure risk. The Forest Service recommends leveraging years of scientific research and strategic planning to increase the scale of forest health treatments over the next decade.

Financial Management

The Forest Service maintains robust contracted resources to support fire operations, e.g., supplemental contracted firefighting crews, showers, food service, bathrooms, and telecommunications. The Service Contract Act's minimum wage increase resulted in a 36% cost increase to the Forest Service for contracted firefighting crews starting in the beginning of

calendar year 2024. Following the conclusion of a 5-year fire retardant contract (2018-2023) during a period of significant cost-push inflation, the 2024 one-year contract price for retardant rose dramatically due to raw material and freight increases, as well as the uncertainty introduced by such a short contract term.