Eugene Springfield Fire

Eugene/Springfield, Oregon

COMMUNITY RISK ASSESSMENT REPORT

February 2020

Emergency Services Consulting International

Providing Expertise and Guidance that Enhances Community Safety

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INTRODUCTION

In March 2019, Eugene Springfield Fire (ESF) retained ESCI to conduct a Community Risk Assessment. This effort was undertaken subsequent to the implementation of an interlocal agreement between the cities to facilitate the joint delivery of fire and life safety services. The new organization, now known as Eugene Springfield Fire, is tasked with providing Fire, EMS, and Life Safety services to both communities. As part of this consolidation, ESF realized that there was little data related to commercial occupancies in the City of Springfield, as well as incomplete and obsolete occupancy data for the City of Eugene. Subsequently, ESF was awarded an Assistance for Firefighters Fire Prevention & Safety (AFG FP&S) grant to conduct an occupancy survey in both cities and complete a Community Risk Assessment, which was performed by ESCI.

During the summer of 2019, ESCI representatives analyzed the consolidated ESF organization, including service delivery, current Fire Prevention Division resources, community demographics, and known hazards. As part of this effort, ESCI conducted a Hazard Vulnerability Assessment with representatives from ESF, City of Eugene Emergency Management, and City of Springfield Emergency Management. Subsequently, ESCI representatives conducted a site visit to further learn about ESF operations, community hazards, and response planning. Representatives from the City of Eugene, Lane County Emergency Management Division, Lane County Health Department, and Lane County 911 were interviewed as part of this effort.

The analysis of ESF operations, resource allocation, and community risk revealed several realities:

- The cities of Eugene and Springfield have a significant natural, human, and technological hazards and risks that require constant attention and allocation of mitigation resources and efforts.
- Lane County, and the public and private entities within, have developed contemporary and comprehensive plans for identifying and mitigating natural hazards throughout the region.
- ESF is a robust all-hazards fire department, with significant emergency operations resources and contemporary deployment strategies.
- The consolidation of Springfield Fire and EMS and Eugene Fire Department appears to have resulted in an enhanced and more efficient emergency services delivery system.
- The recently completed occupancy survey in both cities identified thousands of commercial occupancy hazards that were not previously inventoried (or identified).
- The current resources allocated to fire prevention and life safety code enforcement in both cities is likely not enough to ensure fire and life safety code compliance.
- Lack of ***full*** integration and coordination of internal ESF administration and operations may be an impediment in efficiently responding to, and managing, large-scale disasters.

ESCI was very impressed with the dedication and professionalism of the ESF personnel and others who participated in this project and hope this effort will result in an even more all-hazards resilient organization and community.

ACKNOWLEDGMENTS

Emergency Services Consulting International (ESCI) wishes to acknowledge the various members and leaders of the cities of Eugene and Springfield and other representatives who contributed, and without whose assistance, this project could not have been completed.

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…and the public employees, firefighters, and staff of Eugene Springfield, who daily serve their community with honor and distinction!

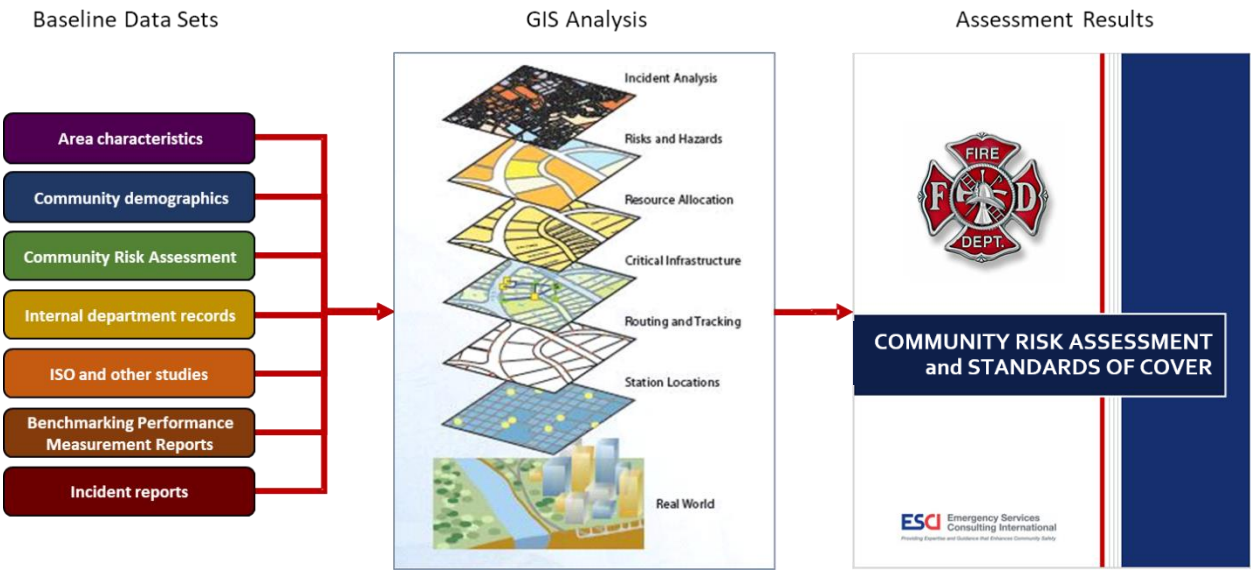
METHODOLOGY

ESCI used the information provided by Eugene Springfield Fire (ESF) to establish a baseline assessment of current hazard conditions and ESF service performance, along with an organizational analysis of basic operations and life safety services. The purpose of this evaluation was to assess the various hazards, risks, and vulnerabilities in the cities of Eugene and Springfield, assess current emergency management and preparedness capabilities in each city, assess existing fire prevention/code enforcement resources, and benchmark against industry standards and best practices—including comparisons with cities of similar size and demographics. It must be noted that this study summarizes the conditions evaluated during a "snapshot" in time, and some environmental or organizational changes may have taken place during the study period.

Additionally, ESCI paid particular attention to assessing and categorizing fire risk by building type/occupancy use in both cities. It is important to note there are uncertainties in any assessment of this type—incomplete data, scientific uncertainty, and the inherent simplification of information within the scope of this study. During this study, ESF initiated an effort to update the occupancy inventory in both cities to incorporate into its occupancy database.

The ESCI Planning Team also collected information, reviewed population and other community growth patterns, and then analyzed trends and expectations to provide a glimpse into future community conditions, land use, and fire protection risks to interpret their potential impact on emergency service planning and delivery. ESCI then used Geographic Information Systems (GIS) technology and historical reporting tools to visualize the data and provide additional information for strategic planning purposes. The following figure illustrates the conceptual GIS methodology as applied to this assessment.

Figure 1: GIS Methodology[1]



SECTION 1:

COMMUNITY AND ORGANIZATIONAL OVERVIEW

THE CITIES OF EUGENE & SPRINGFIELD

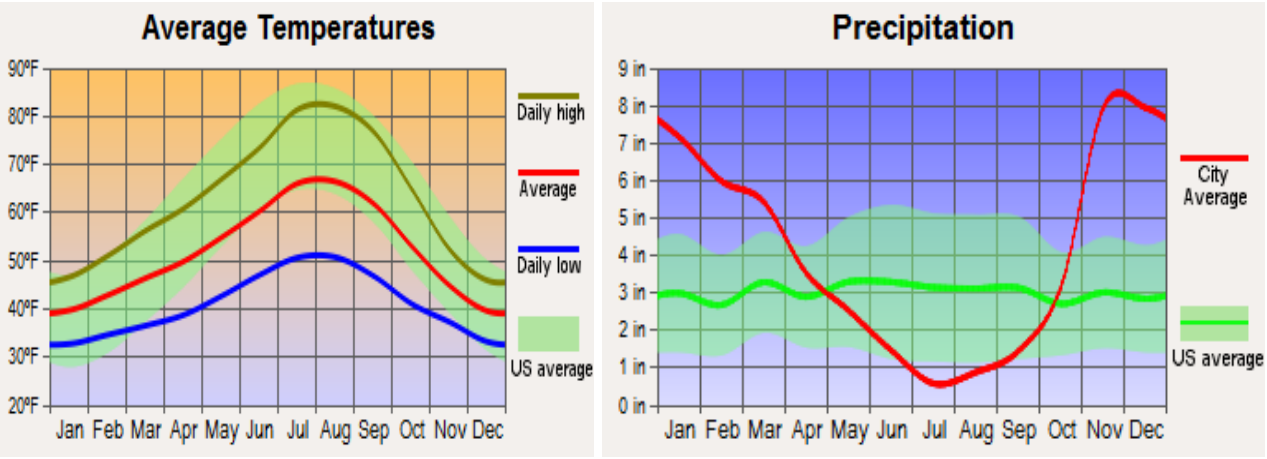
The cities of Eugene and Springfield are located adjacent to each other in west-central Oregon, at the southern end of the Willamette Valley, near the junction of the Willamette and McKenzie rivers. Located in Lane County, both communities have a long and storied past. Settlers first moved into the area in 1846, established lumber and flour mills, and platted, what was then known as Eugene City, in 1852. The name was changed to the City of Eugene upon incorporation in 1862, and the City of Springfield was platted and incorporated in 1885.[2,3]

The communities of Eugene and Springfield have well-earned reputations as outdoor recreation and sports hubs. Eugene is the birthplace of the Nike Company and the University of Oregon, and is also known by the nickname "Track Town." The region hosts numerous regional, state, and national track and field events. Eugene was selected to host the Olympic Track and Field Trials in 2020, and for the first time in the U.S., the World Athletic Championships in August 2021. It is anticipated that over 2,000 athletes and 8,000 media representatives from around the world will participate and bring in thousands of spectators during this 10-day event. This seminal event, in no small part, compelled completion of this study to ensure ESF can prepare for the influx of spectators, athletes, and media, along with preparing for increased future growth, which may result from this event.

Weather & Climate

Eugene and Springfield experience a very temperate climate, with an annual average high temperature of 63.3°F, and an annual average low temperature of 41.7°F, with an overall average temperature of 52.5°F.[4] The average annual precipitation (rainfall) is just over 46 inches, with an average annual snowfall of 5 inches.[5] The following figures are graphic representations illustrating temperature and precipitation averages in Eugene and Springfield on a monthly basis.

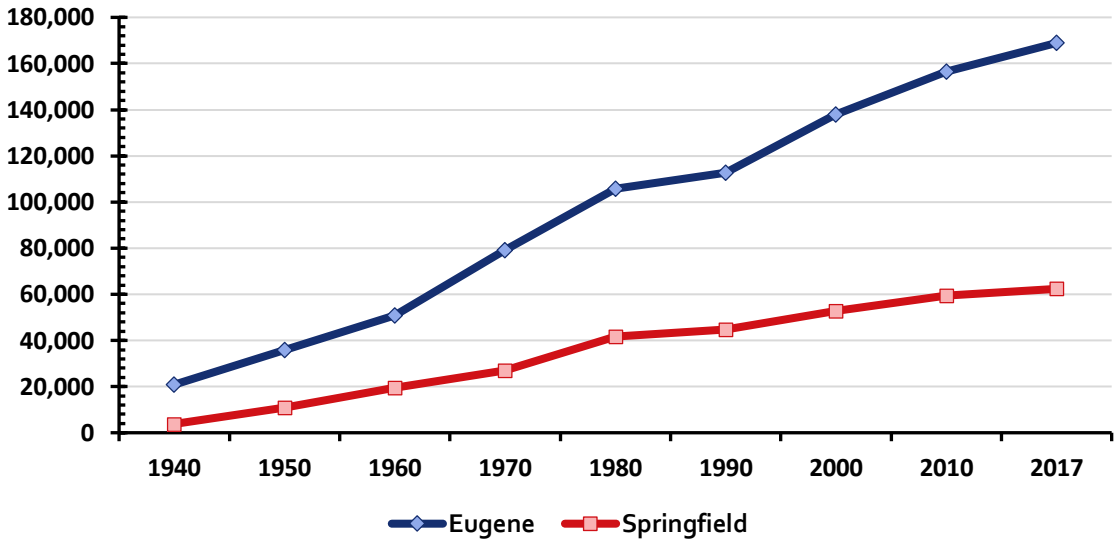
Figure 2: Eugene and Springfield Weather Data



Regional Demographics

At the time of this study, the current service area population for Eugene and Springfield was estimated at 231,272.[6] This number reflects only the population residing inside the city limits. Approximately 36,000 additional residents are located within the contracted ESF service areas outside of the respective city limits.[7] The populations in both cities have grown between 2000 and 2017, with an average annual growth rate of 3%. The following figure illustrates resident population growth since 1940.

Figure 3: Eugene and Springfield Population Growth, 1940–2017



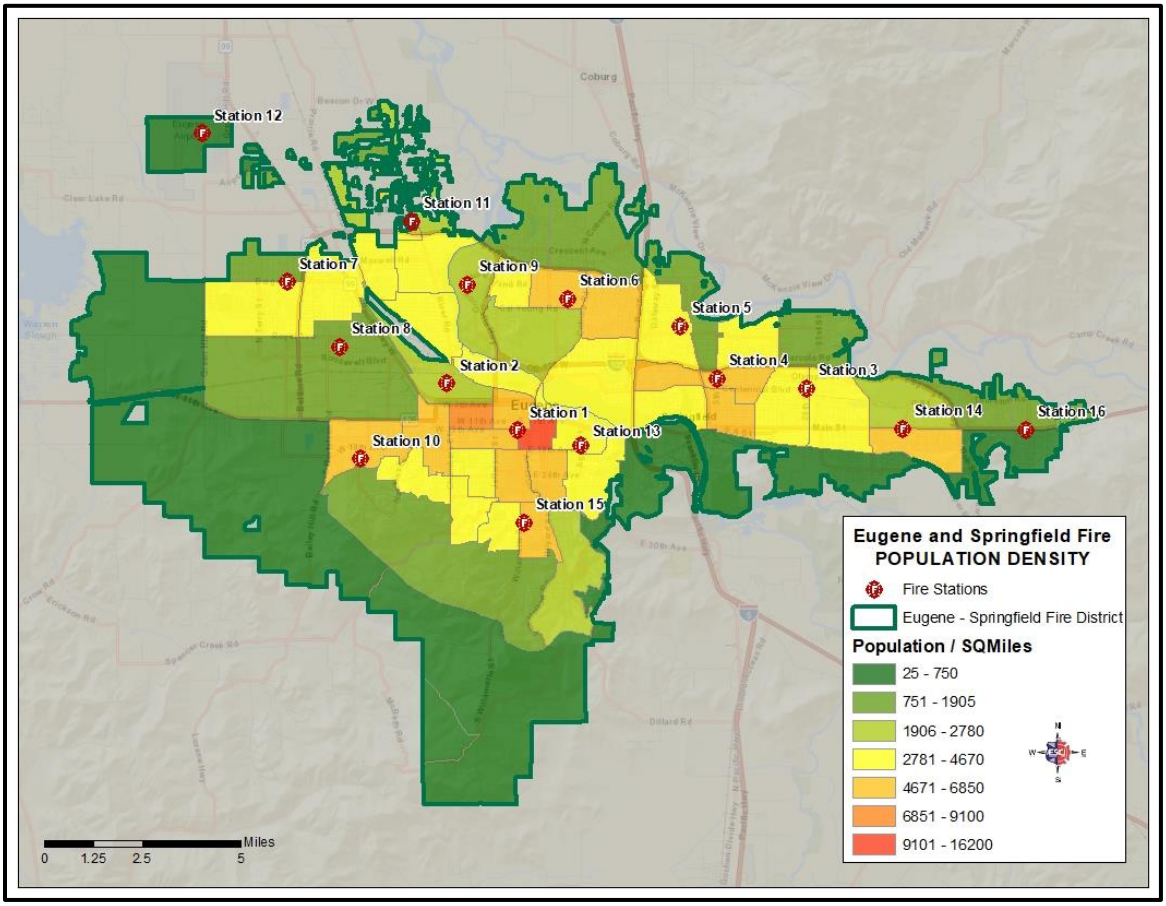
Population

The average population density in the urban/suburban service area is approximately 3,660 people per square mile in Eugene, and 3,840 people per square mile in Springfield. The population densities in the outlying contracted rural/suburban service areas range from 25 to 2,780 people per square mile.

The ESF service area has characteristics of urban, suburban, and rural areas of Lane County (specifically for EMS delivery). The urban areas are characterized by a large number of single-family neighborhoods, significant commercial and light industrial development, a large state university, dense neighborhoods including multi-family housing, large "big box" stores, and a mix of mid-rise or high-rise buildings—the highest is 19 stories tall.

The population density is highest in the Eugene and Springfield urban areas and diminishes with distance from the urban cores in each city. As expected, the areas of the highest population density correspond to the locations of multi-unit housing and older, centrally located neighborhoods. It also appears the areas displaying the highest population density correspond to the areas with the highest service demand as shown in Figure 4.

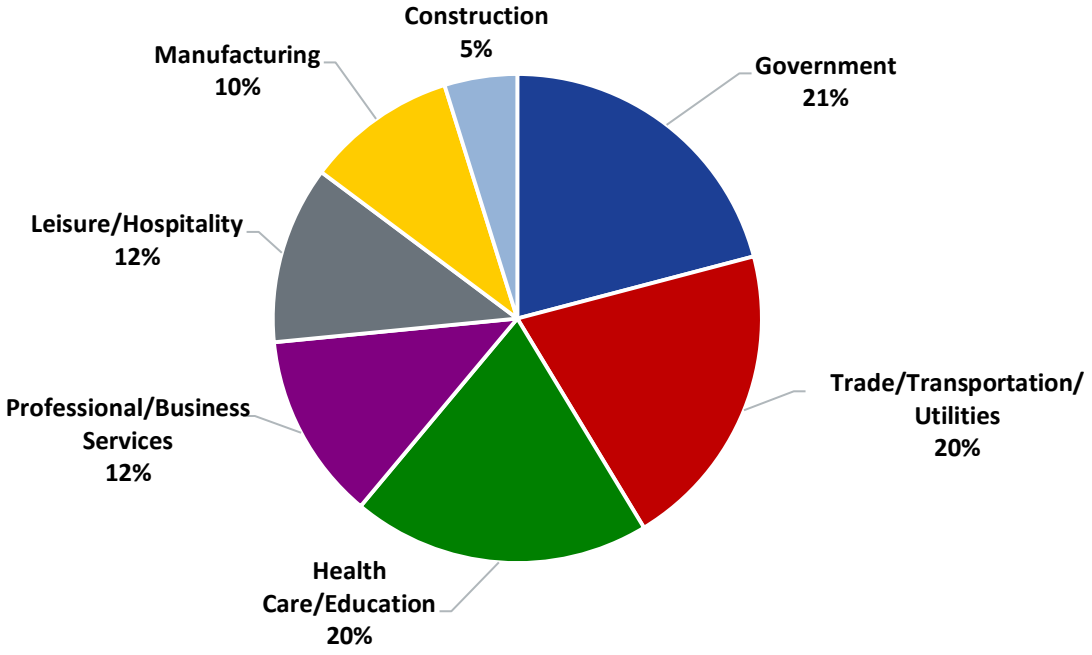
Figure 4: Population Density



Economic and Jobs Information

The Eugene and Springfield area labor market primarily supports the following economic sectors: Health care and education, trade/transport/utility services, leisure and hospitality services, manufacturing, and business/professional services.[8] The following figure summarizes the number of jobs in the Eugene and Springfield area in each of these sectors, per the U.S. Department of Labor-Bureau of Statistics.

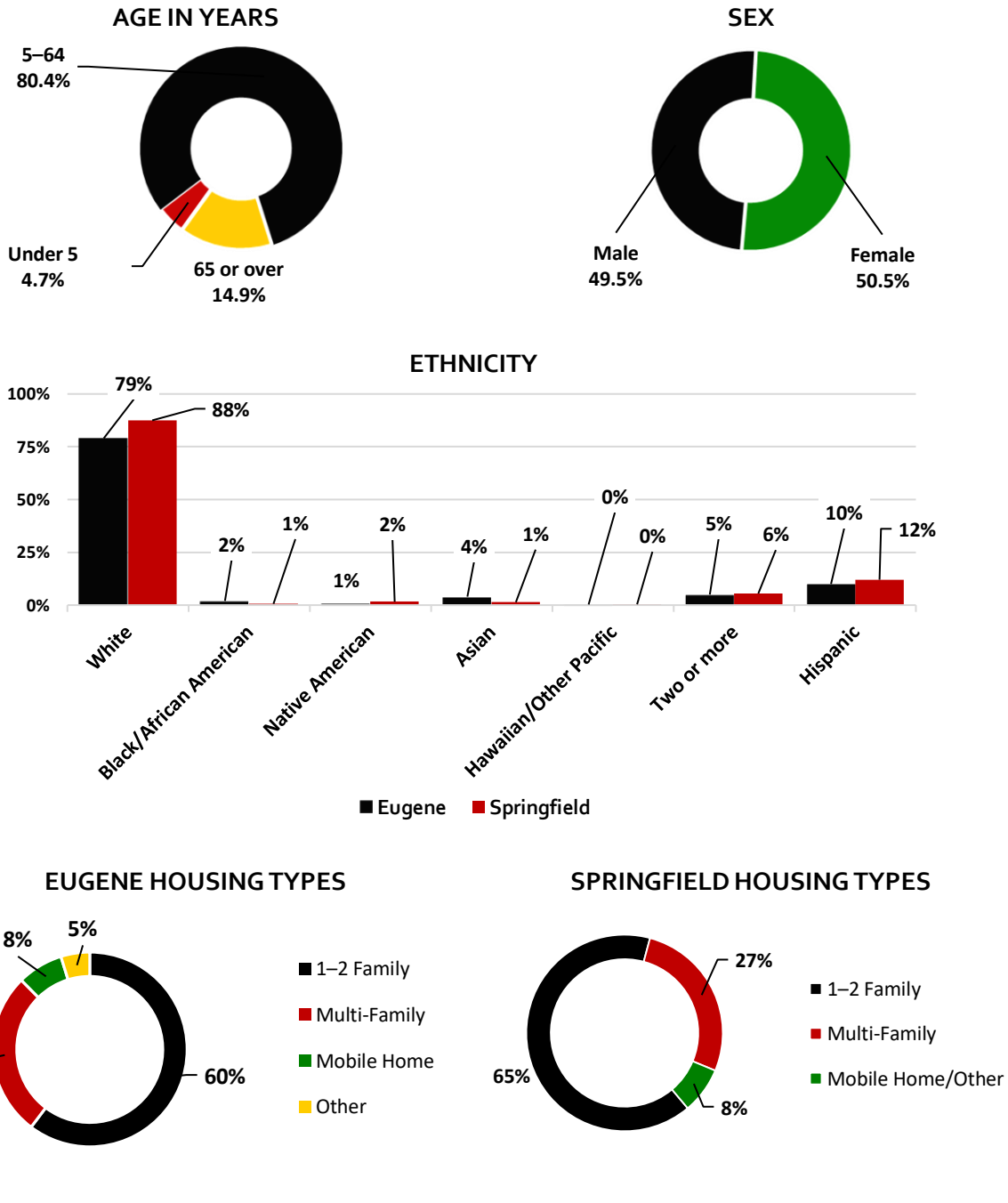
Figure 5: Largest Job Categories as of February 2019

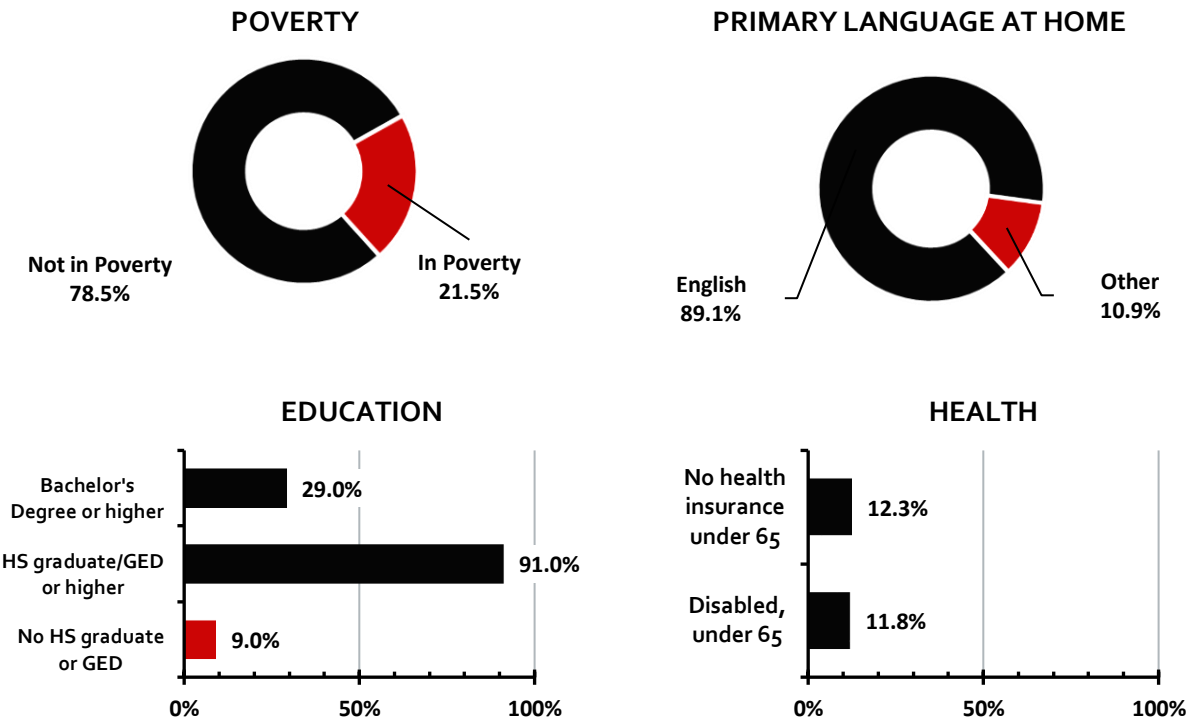


Select Demographics

Select demographics for Eugene and Springfield—age, sex, ethnicity, housing type, income level, primary language, education, health, and assessed property values—are shown in the following figures. For brevity purposes, ESCI averaged slight differences in demographic results between the two cities, where appropriate.

Figure 6: Select Demographics[9]





Demographics Discussion

In addition to the distribution of the population, population demographics can affect the nature of risk and emergency service demand. In urban cities, several factors have been identified that place certain groups of people at higher risk of being injured or killed in a fire. An NFPA report identified these groups as: [10]

- Children under 5 years of age;
- Older adults over 65 years of age;
- Lack of health insurance;
- People with disabilities;
- People with a language barrier; and
- People in low-income communities.

These segments of the population are also more likely to use fire department services, especially EMS, than other population groups. EMS incidents represent the overwhelming majority of service demand—over 70% of all responses in the ESF service area. The following is a further explanation of these special risk groups, and their impact on emergency services.

Age: The elderly may have difficulty escaping from fire due to physical limitations and diminished sensory perception (primarily hearing and vision). Quality of life issues, chronic illness, and the proliferation of assisted living/nursing home facilities also increase emergency medical service demand. The very young also represent a vulnerable population, as they cannot appropriately and quickly recognize and react when faced with an immediate danger situation.

Lack of Health Insurance: People under 65 years of age with no health insurance are more prone to chronic illness or exhibit poor physical condition simply because they do not seek prompt treatment. About 10% of the ESF population under age 65 do not have health insurance, which likely results in higher demand on the EMS system.[6]

Disabilities: People under 65 years of age with disabilities comprise almost 10% of the ESF population, and may be incapable of quickly recognizing an emergency and react appropriately.

Language Barrier: Segments of the population may have cultural differences or language barriers that inhibit their ability to call for help when needed or effectively communicate their needs and concerns. According to the NFPA, "Language barriers, cultural differences, and inexperience with unfamiliar home technologies are factors that mark the challenges of helping newcomers live safely from the threat of fire in the home."[11] Just over 8% of the Eugene and Springfield population is foreign-born, and 11.5% of the population speak a language other than English at home.

Low-Income: Those with low incomes use fire and EMS services more often than those with higher incomes. Over 21% of the Eugene and Springfield resident population lives below the poverty level. The U.S. Census Bureau 2018 poverty threshold is defined as $13,064 for an individual and $25,554 for a family of four. Low-income is often combined with other factors such as education or work status.

ORGANIZATIONAL OVERVIEW

The following is a brief description of each city's governance structure and their respective emergency management/response organizations.

City of Eugene

The City of Eugene is the second-largest city in Oregon, with an estimated population of 171,245 and an incorporated area of 43.9 square miles.[6] The City of Eugene is governed by a City Council, comprised of eight Council Members and a Mayor, who serves as the Council Chairperson. An appointed City Manager is responsible for the administration of all city departments, including Central Services, Public Works, Library, Recreation & Cultural Services, Planning & Development, Police, and Fire & Emergency Medical Services.

City of Springfield

The City of Springfield is the ninth-largest city in Oregon, with a population of 62,353 and has an incorporated area of 15.7 square miles.[12] The City of Springfield is also governed by a City Council, comprised of six Council Members and a Mayor, who serves as the Council Chairperson. An appointed City Manager oversees eight city departments, including Development Services, Finance, Human Resources, Information Technology, Library, Police, Public Works, and Fire and Life Safety.

Eugene Springfield Fire

Fire and life safety services in both cities are delivered by a functionally consolidated organization known as Eugene Springfield Fire (ESF). In an effort to gain efficiencies between the two organizations, a 2010 interlocal agreement (IGA) was created between the two cities, resulting in a consolidation of Eugene and Springfield fire department administrative and support services. Subsequent additional support services consolidations occurred, culminating in full consolidation of emergency operations in August 2014, and the creation of Eugene Springfield Fire. ESCI notes that fire department employees in both cities technically retain employment in their respective cities, even though they operationally deploy as one department.

Programs & Services

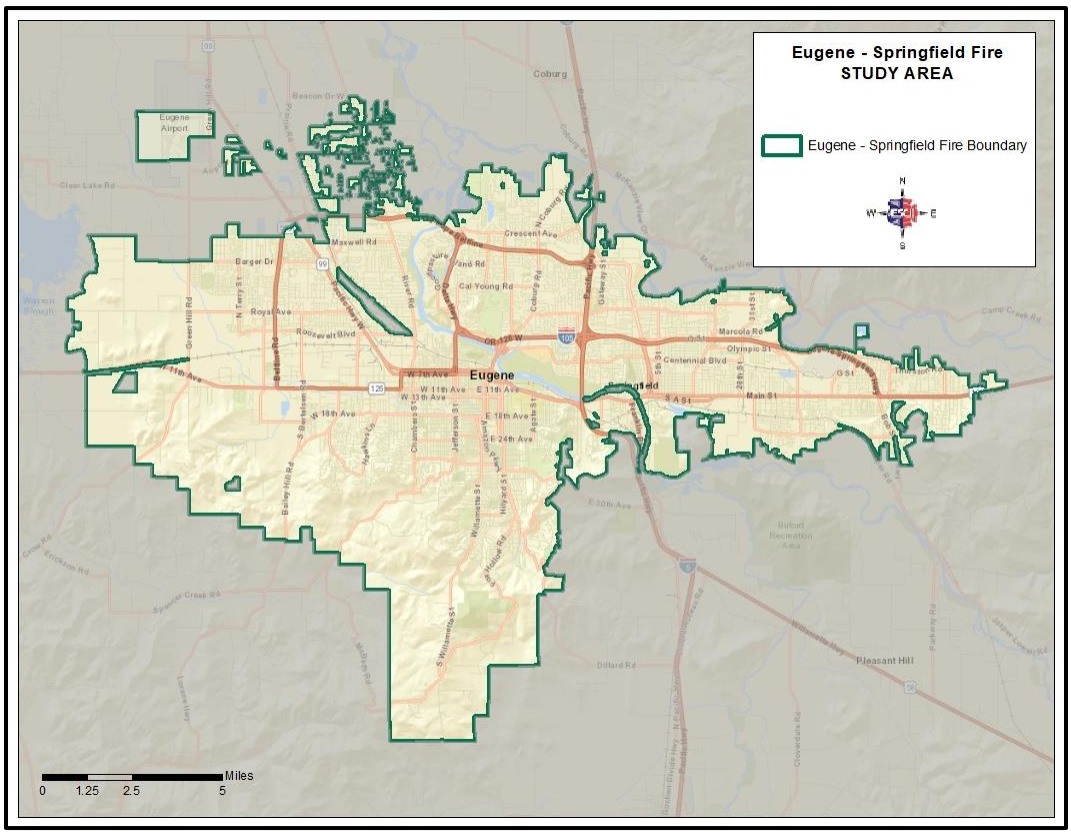
ESF operates under five functional divisions: Office of the Chief, Shift Operations, Special Operations, Fire Marshal's Office, and Administrative Services. Each Division is administered by a Division Manager, who reports directly to the Fire Chief.

Services include the following:

- Fire suppression: structural, marine, aircraft, wildland
- Specialized/technical rescue
- Hazardous materials management, response, and mitigation
- First response emergency medical care (EMS) and ALS ambulance transport
- Fire prevention, education, and life safety outreach education
- Risk reduction
- Code enforcement and plans review
- Fire/arson investigations
- Routine on-going and specialized training
- Logistical support, operations analysis, financial management, planning, and record-keeping
- Fleet & facility maintenance
- Other support services[13]

The ESF service area is shown in the following figure.

Figure 7: ESF Service Area



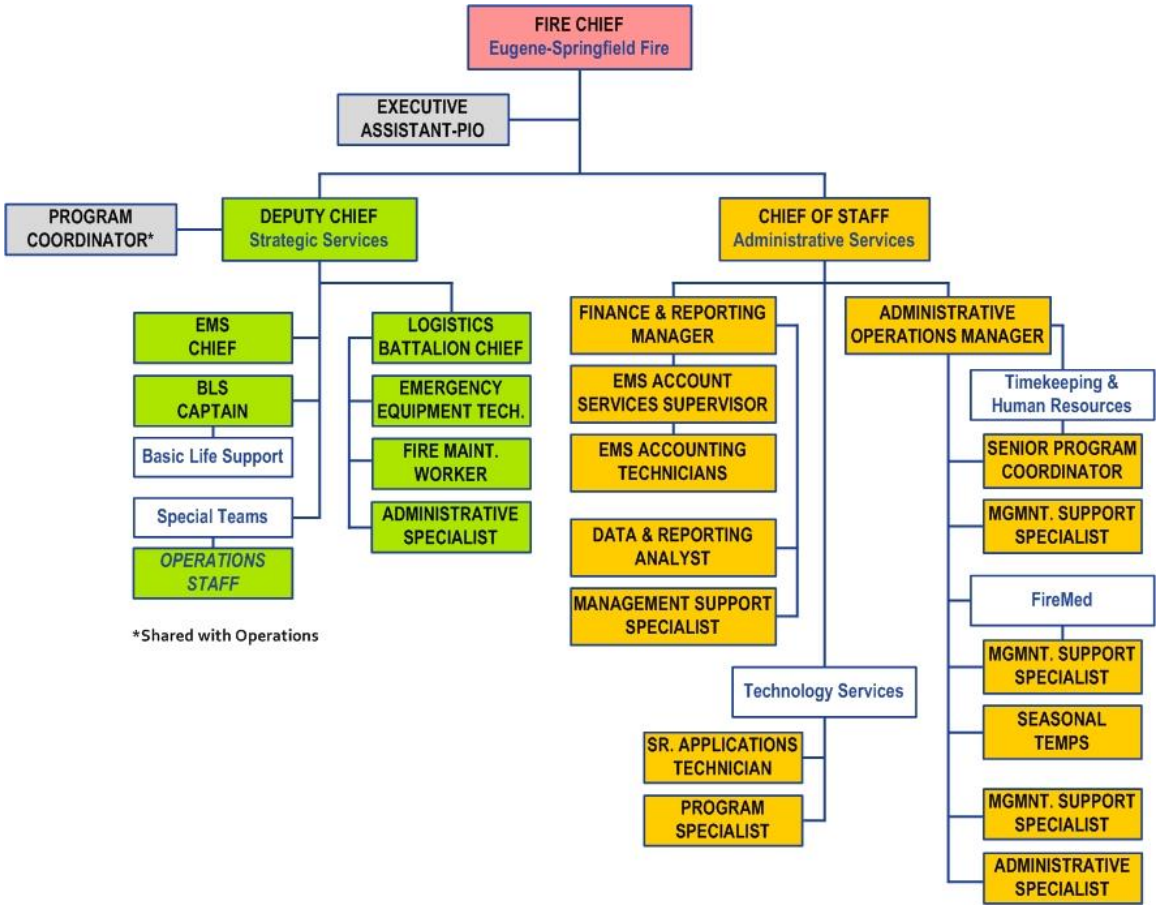
The service area includes several neighboring special districts served by ESF through intergovernmental contracts. The Department provides fire suppression and emergency response services to the following districts:

- Bailey-Spencer Rural Fire Protection District (RFPD)
- Eugene Fire District #1 RFPD
- Glenwood Water District
- Rainbow Water District
- River Road Water District
- Willakenzie RFPD
- Zumwalt RFPD

Organizational Structure—Administrative

The following figure illustrates the current ESF Strategic Services/Administrative Services structure:

Figure 8: ESF Strategic Services/Administrative Services Structure

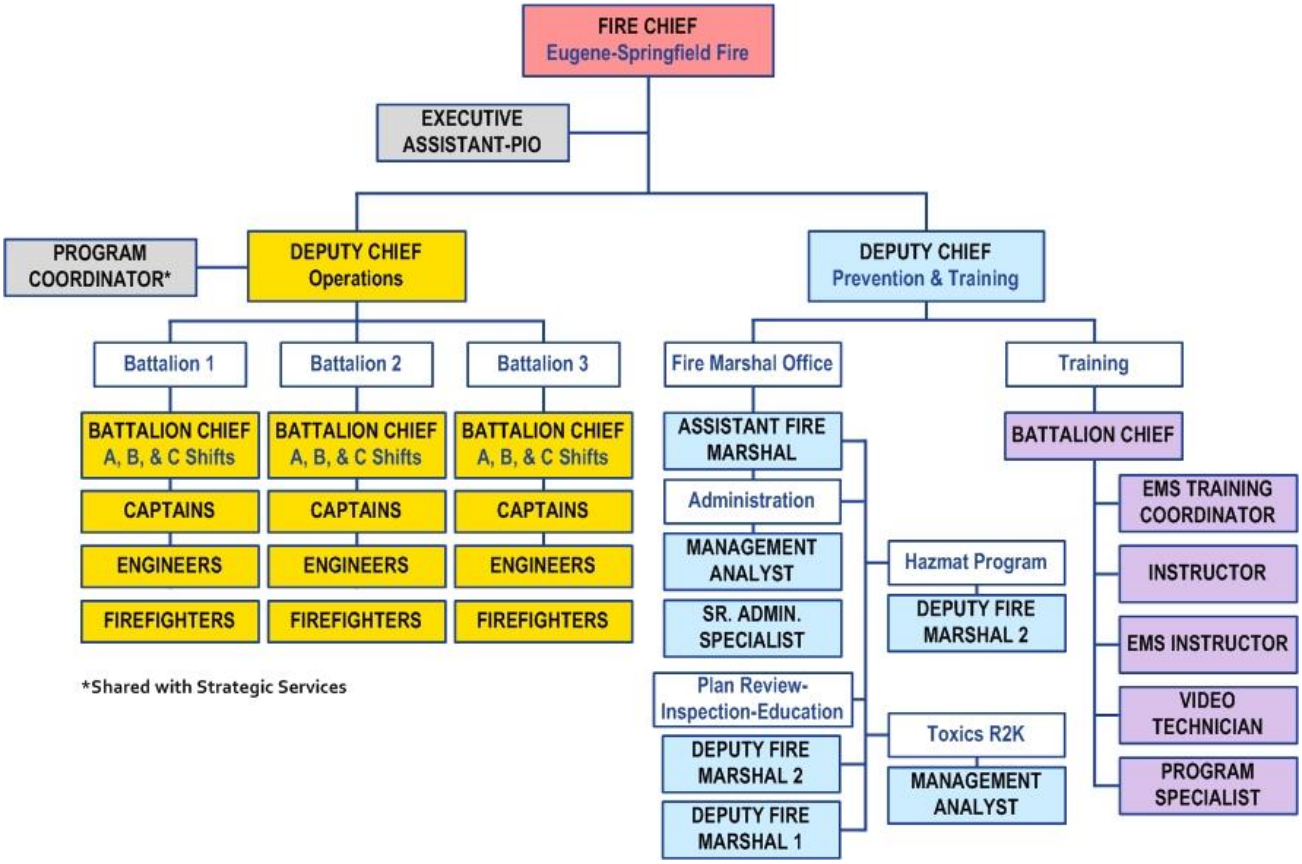


Due to the size of the organization, ESF provides a robust and wide range of administrative services related to human resources, payroll, information technology, accounting and EMS billing, logistical and equipment maintenance, and EMS operations. In many cities, some of the internal services shown in the preceding figure are often provided by other city departments (Information Technology and Human Resources, for example). ESCI noted the City's Central Services Department provides similar services to other City departments. This redundancy could be advantageous in the event ESF or Central Services experience a significant business disruption.

Organizational Structure—Operations/Prevention/Training

The following figure illustrates the structure and reporting relationships of the Operations, Fire Prevention, and Training Divisions.

Figure 9: Operations, Fire Prevention, and Training Divisions



Except for the Toxics Right to Know (R2K) program, the other positions are common in large urban fire departments. The Toxic R2K program, mandated by changes to the City's charter in 1996, is unique to the City of Eugene. The law requires that certain businesses within the City of Eugene that use federally listed hazardous substances provide public information concerning the use and disposition of these substances. The program is managed by a Management Analyst and funded through user fees.

Vision, Mission, & Values

The ESF 2015 Standards of Coverage Study identified the following core values and tenants guiding department operations:

MISSION

To serve our communities by preserving life, protecting property, and the environment through prevention, education, emergency medical services, rescue, and fire suppression services.

VISION

To deliver efficient and effective services by working together to maintain a progressive, caring, professional organization that remains flexible within a changing environment. We strive to be recognized for our leadership within the region and the state by fostering cooperative working relationships. We work to be innovative, fiscally responsible, and financially stable and secure.

VALUES

We value respect, integrity, accountability, teamwork, service, and adaptability. We measure our success by the satisfaction of the communities we serve, our personnel, and our strategic partners.

Emergency Management

Each city supports Emergency Management (EM) programs differently. In the City of Eugene, EM is located in the city's Risk Services Division of the Central Services Department. The Eugene EM program is staffed by an EM Coordinator and two EM Analysts.

EM responsibilities in the City of Springfield are located in the City's Development and Public Works Department. One full-time employee oversees the City's EM programs.

Eugene and Springfield EM programs closely coordinate with other community EM programs, including:

- Lane County Emergency Management
- Oregon Office of Emergency Management
- University of Oregon Safety and Risk Services Department
- Eugene Water and Electric Board (EWEB)
- Springfield Utility Board

ESF Fire Prevention Division

The Fire Prevention Division is overseen by an acting Fire Marshal. The division is also staffed with an acting Assistant Fire Marshal and six Deputy Fire Marshals (DFMs). Three DFMs are assigned to new construction and plan review responsibilities. Two FTEs are responsible for the City of Eugene, and 0.4 FTE is responsible for the City of Springfield. The remaining 0.6 FTE is responsible for land use and planning review in the City of Springfield. Currently, these three Deputy Fire Marshals have special funding limitations and are specifically assigned to and funded by new construction permit revenue from the Eugene and Springfield Building Departments.

The other three DFMs are assigned to handle complaints, maintenance inspections, event and hazardous material operational permitting, FPS maintenance tracking, public education, and the Juvenile Fire Setter program. In addition, all six Deputy Fire Marshals are also responsible for fire investigations. This additional assignment is based on an on-call rotation system.

The following figure shows the Fire Prevention completed workload for the Fiscal Year 2019 (FY 2019).

Figure 10: ESF Fire Prevention Division Completed Work, FY 2019

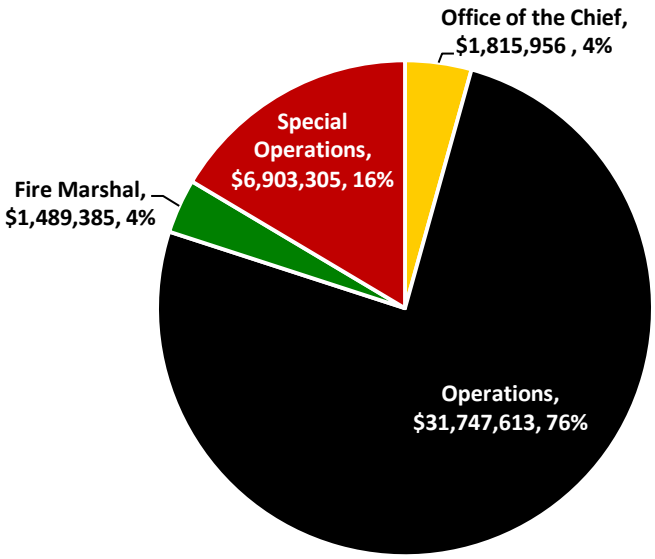
Fire Investigations	Total	Percent	Target
Total ESF responses to fires	770		
Fires Investigated by the Fire Marshal's Office	149	19%	
Fire Investigations where the cause was determined	86	58%	95%
Inspections	**Total**	**Eugene**	**Springfield**
New construction	615	444	171
Code enforcement	806	614	192
Operational permits	241	201	40
Hazmat permits	513	315	198
Total Inspections	**2,175**	**1,574**	**601**
Reviews	**Total**	**Eugene**	**Springfield**
Plans reviews	1,669	1,526	143
Land use reviews	190	70	120
Operational permit reviews	235	195	40
Total Reviews	**2,094**	**1,791**	**303**
Community Education/Outreach	**Total**	**Ratio**	
Public Education Events	125		
Number of people reached	5,811	46:1	

ESCI noted that the department does not currently use operations crews to conduct routine fire inspections. All fire inspections are conducted by Inspector-certified Fire Prevention Division staff.

Funding Sources

The City of Eugene's adopted 2019 operations expenditure budget for ESF is $41,956,259, which was an increase of 2.8% over the FY 2018 Adopted Budget.[14] The City of Springfield's adopted 2019 operations budget for ESF is $19,977,430, which is an increase of approximately 5% compared to the amended 2018 budget.[15]

Figure 11: FY 2019 Eugene Fire Budget



In general terms, the proportion of each city's budget contribution is based on the number of fire battalions in each department—two ESF battalions and one Springfield battalion. As a result, Springfield's general fund contribution to ESF is approximately one-third of the overall ESF budget.

SECTION 2:

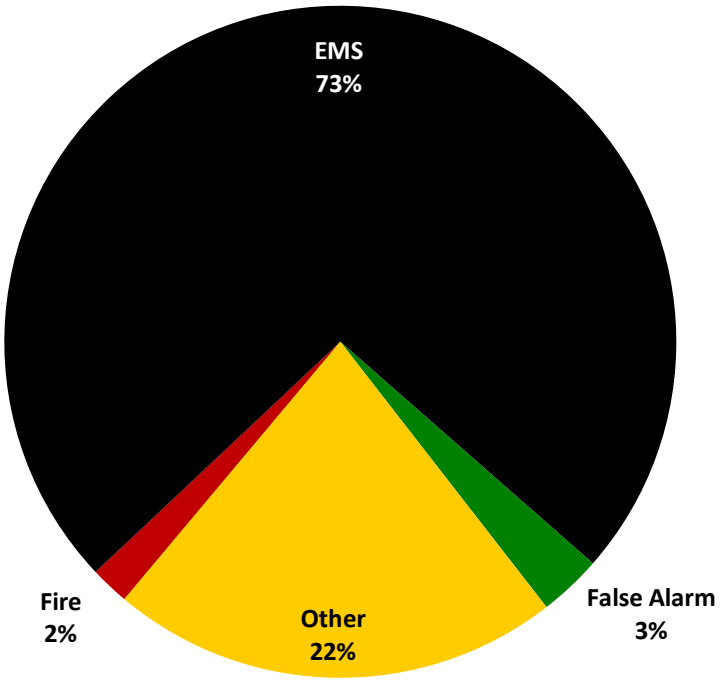
SERVICE DELIVERY

Responses by Incident Type

ESCI evaluated the last three complete years of incident data to identify service demand and trends, incident types, incident density within the service area, and response time performance. ESCI did not include FY 2019 year-to-date data in this analysis.

During 2018, ESF responded to 37,721 incidents, including mutual and automatic aid responses. The next figure shows responses by type of incident during 2018. Emergency medical services (EMS) responses, including motor vehicle accidents, are the most common at 73% of total responses.

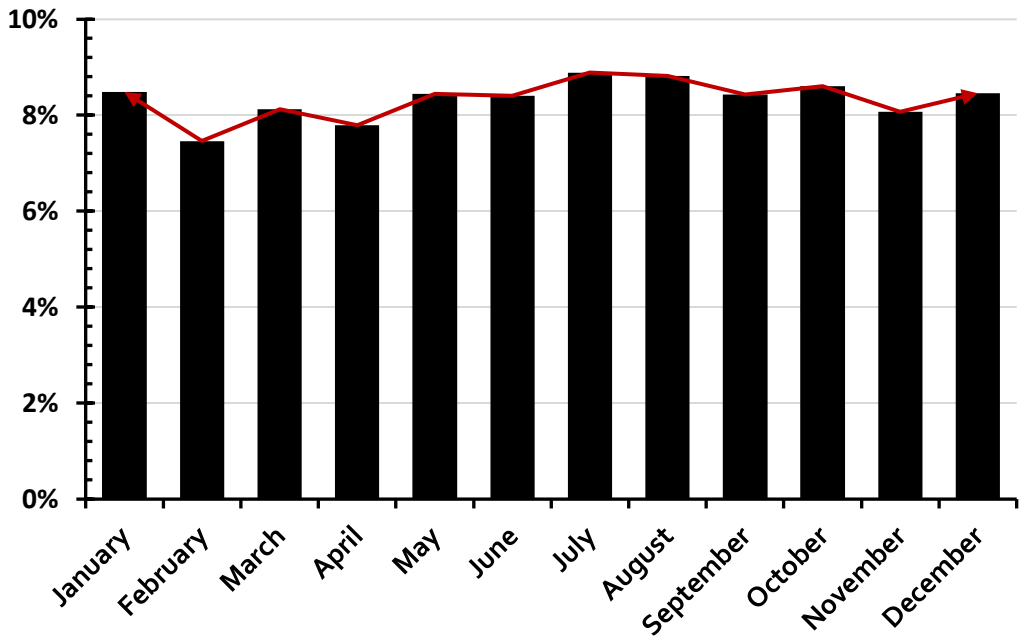
Figure 12: Responses by Incident Type, 2017–2018



Temporal Variation

ESCI analyzed incident data to identify specific service demand trends during certain periods. The following figure illustrates the monthly demand over the past three years.

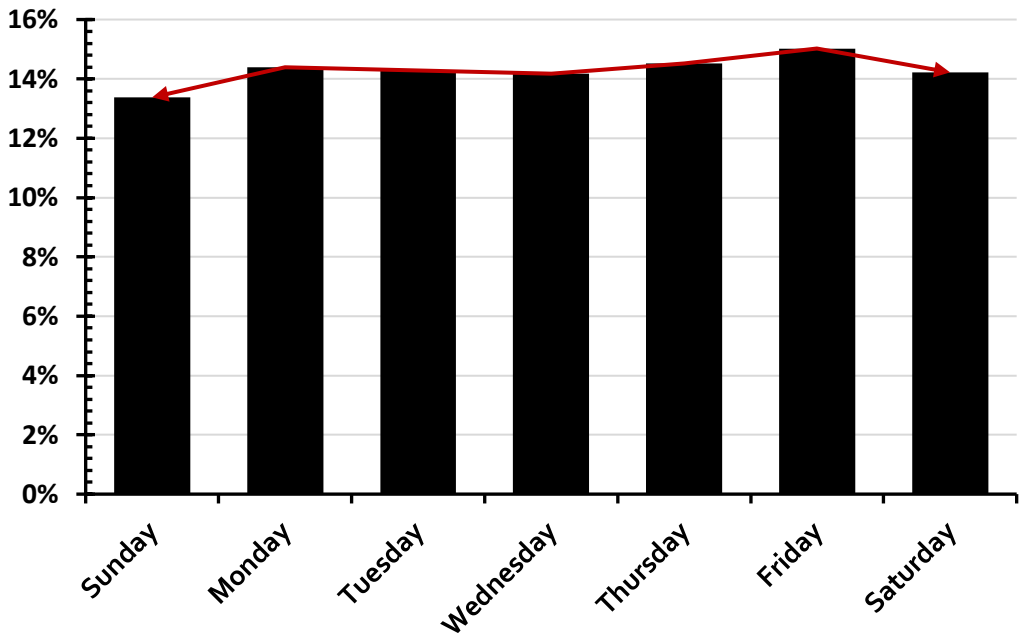
Figure 13: Service Demand by Month, 2015–2018



As shown in the preceding figure, monthly service demand remained relatively consistent throughout the year. The busiest month for ESF was July, which accounted for nearly 9% of the total incident volume (13,566 incidents) over the three years. February was the slowest month, accounting for 7.5% of the total incident volume (11,391 incidents). The range between the busiest month and the slowest month was only 1.4%.

The next figure illustrates service demand by day of the week.

Figure 14: Service Demand by Day of the Week, 2015–2018

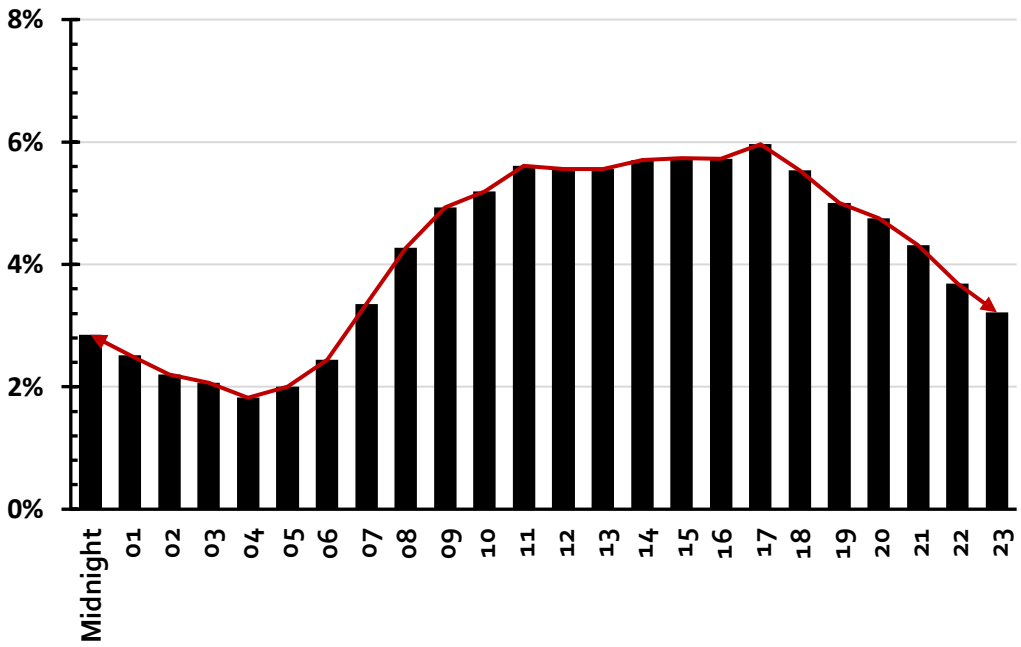


Similar to the analysis of the service demand by month, the service demand by day of the week remained relatively consistent. The most noticeable variation occurred during the weekends when service demand decreased. This is not surprising, as transient student and worker populations and business activity are greater during the workweek.

Friday was the busiest day for ESF, accounting for 15% of the total call volume (22,925 incidents) over the study period. Sundays were the slowest day accounting for just 13.4% of the total call volume (20,413 incidents). While demand varied from day to day, the percentage range (1.6%) between the busiest and the slowest day was insignificant.

Lastly, the following figure illustrates service demand by the hour of the day.

Figure 15: Service Demand by Hour of the Day, 2015–2018



Analysis of service demand by time of the day corresponds with the work and life rhythms of the general population. Human activity, and corresponding incident demand, increased during daytime hours and decreased at night. The incident activity was highest (60% of total incidents) between 9:00 a.m. and 7:00 p.m. The highest incident activity was in the 5:00 p.m. hour, which equaled 6.0% (9,099 incidents) of the total activity per day. The slowest hour for activity was 4:00 a.m., which accounted for 1.8% (2,779) of the daily incident activity.

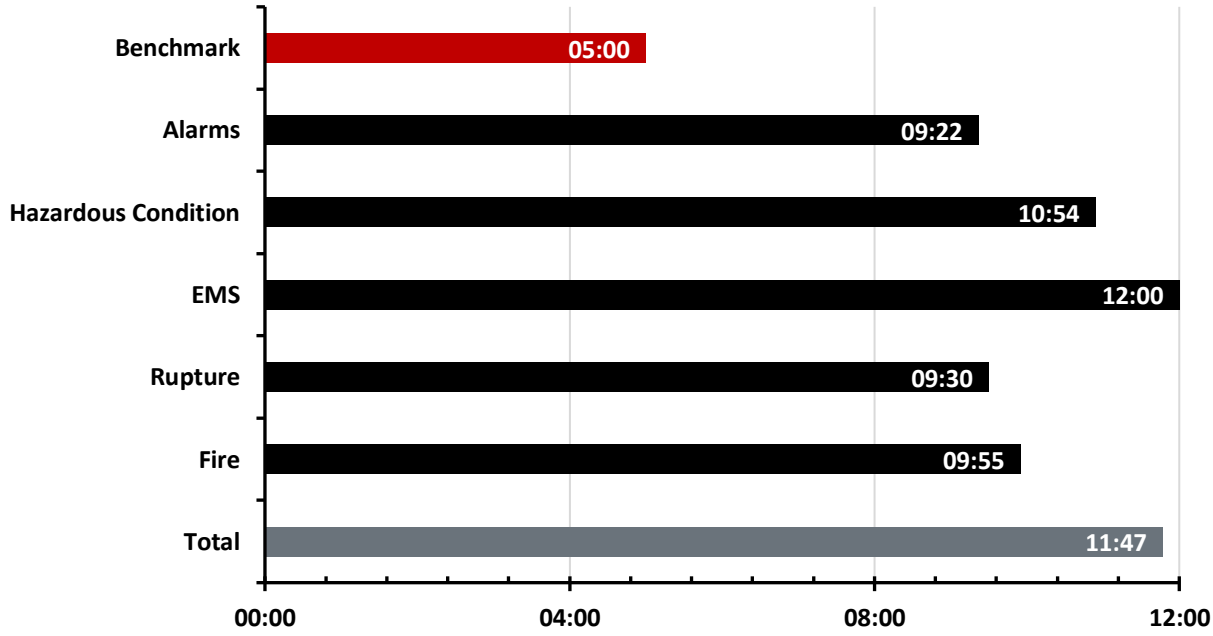
Note that while service demand is lower in the early morning hours, most residential fire fatalities occur late at night or in the early morning hours. From 2014 to 2016, residential fire fatalities were highest between 1:00 a.m. to 2:00 a.m. The 8-hour peak period (11 p.m. to 7 a.m.) accounted for 48% of residential fatal fires.[16]

Response Time Performance

Evaluating turnout and travel time is the most commonly used measure of fire department response time performance. Turnout time starts when fire personnel are notified of an incident (dispatch time) and ends when they begin traveling to the incident (en route time). Travel time starts when personnel begin traveling to the incident (en route time) and ends when they arrive on the scene (arrival time). The first arriving incident response data provided by Eugene Springfield Fire did not include the apparatus en route time, which prevented ESCI's ability to analyze apparatus turnout times. Therefore, ESCI could only evaluate overall apparatus response time performance (from time of dispatch until arrival on the scene).

The following figures illustrate ESF's emergency first arriving response time performance for 2017 through 2018.

Figure 16: All Incident Response Time Performance at 90th Percentile, 2017–2018

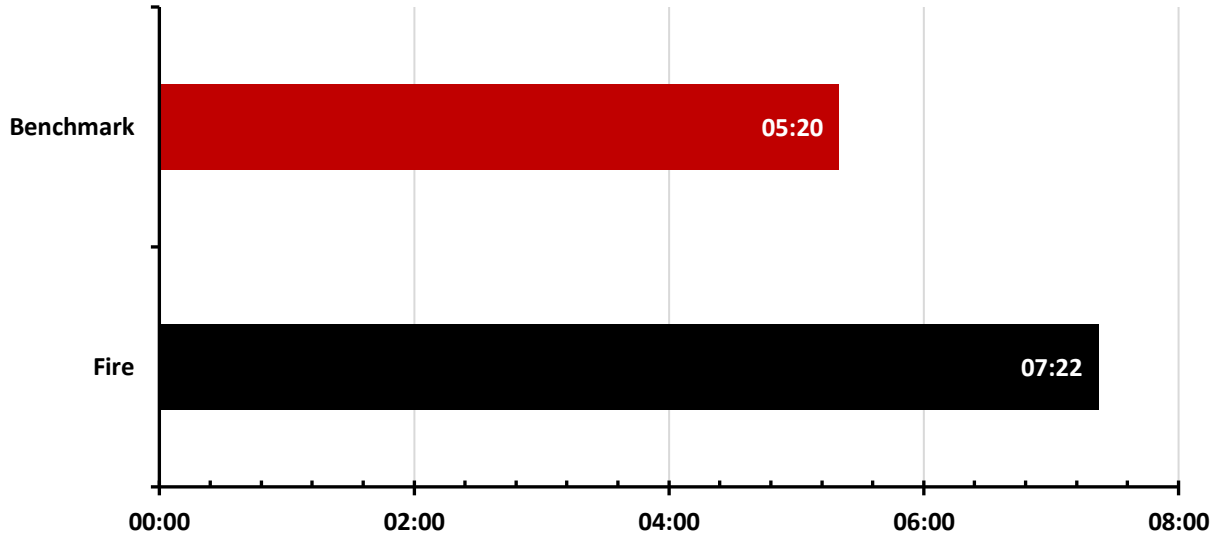


NFPA 1710 identifies 60 seconds for turnout time to EMS incidents, and 80 seconds for fire and special operations incidents, and 240 seconds for travel time for the first arriving fire unit to a structure fire or AED capable response unit to a cardiac arrest. For EMS incidents, this equals 300 seconds (5 minutes) for total response time. Measuring from the time of dispatch until the time of arrival is consistent with the NFPA response time benchmark, even though the turnout time is unknown. On average, Eugene Springfield exceeds the 5 minutes, 90th percentile benchmark by 5 minutes, 22 seconds (05:22).

In assessing response times, ESCI acknowledges that many incident types may not require a rapid, "lights and siren" response, which can affect overall response time performance. In an attempt to more accurately assess response time performance to the most critical incident types, the incident response data provided was filtered to focus only on Building Fire and Advanced Life Support incident types.

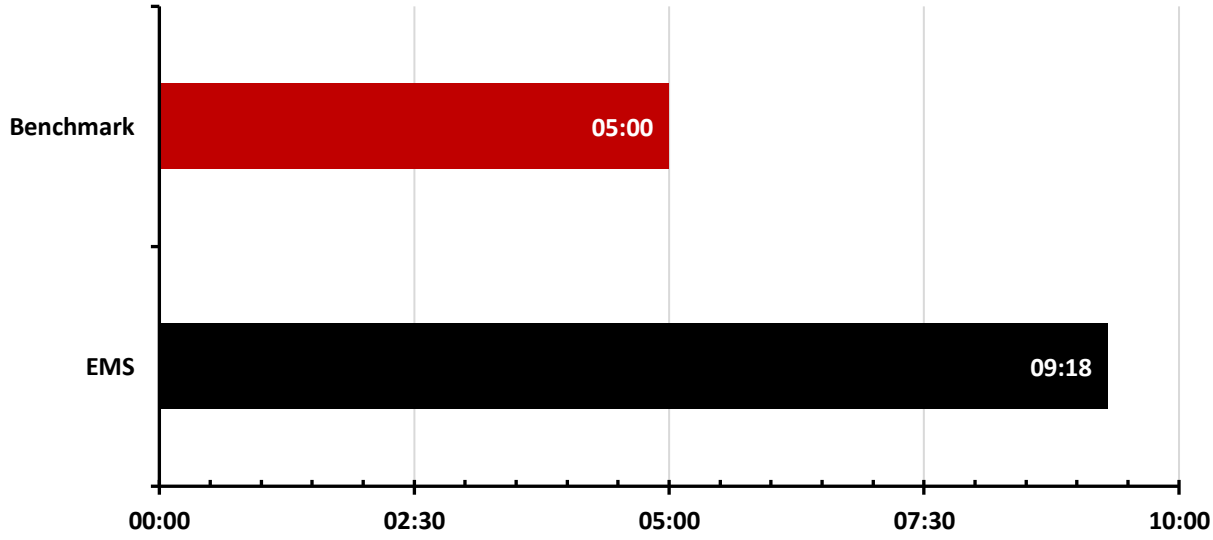
ESCI filtered the incident data in Figure 17 only to include building fires and fires in a structure other than a building (NFIRS Incident Type 111 and 112) where the initial incident action is "extinguish" (NFIRS Action Code 11).

Figure 17: Building Fire Response Time Performance, 2017–2018



ESCI filtered the incident data in Figure 18 only to include EMS incidents, traffic accidents with injuries, pedestrians struck by vehicles, and traffic accidents with entrapment (NFIRS Incident Types 321, 322, 323, and 352) where Advanced Life Support Care was provided (NFIRS Action Code 33).

Figure 18: ALS EMS Response Time Performance, 2017–2018

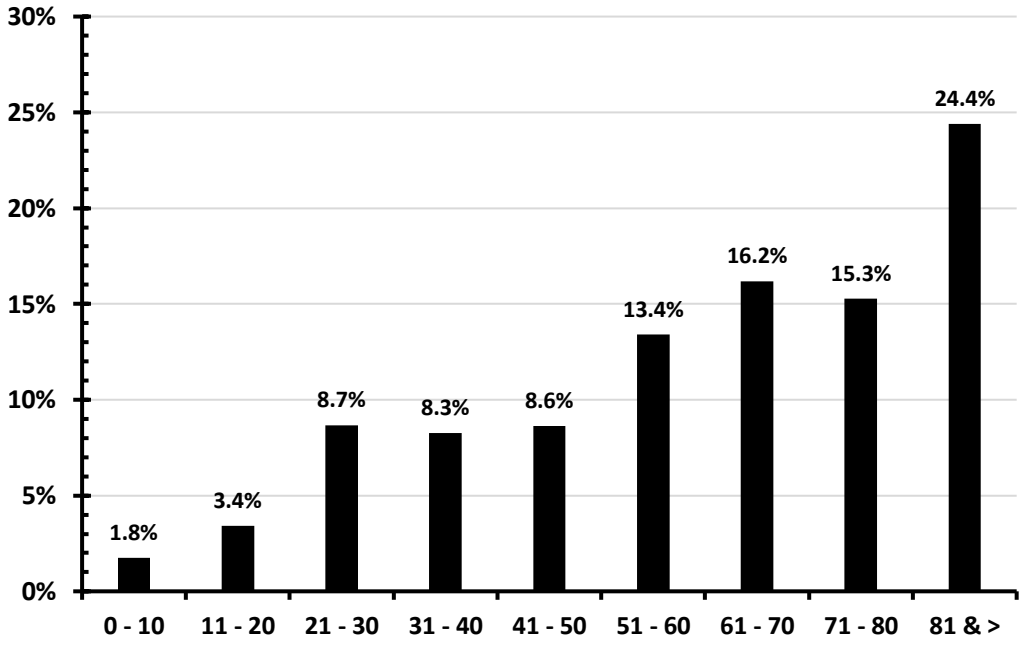


As apparent from the preceding figures, ESF does not meet the NFPA 1710 90th percentile benchmark times for responding to building fires or ALS EMS incidents. ESCI also noted that the response time to EMS incidents was significantly longer than the response to fire incidents, even though firefighters must don their protective clothing before beginning the response to the scene. This disparity may simply be the result of the significantly larger number of EMS incidents compared to structure fire incidents. It may also reflect non-lights and siren responses as initially triaged by emergency medical dispatch protocols, but required ALS intervention once on-scene.

EMS Service Delivery

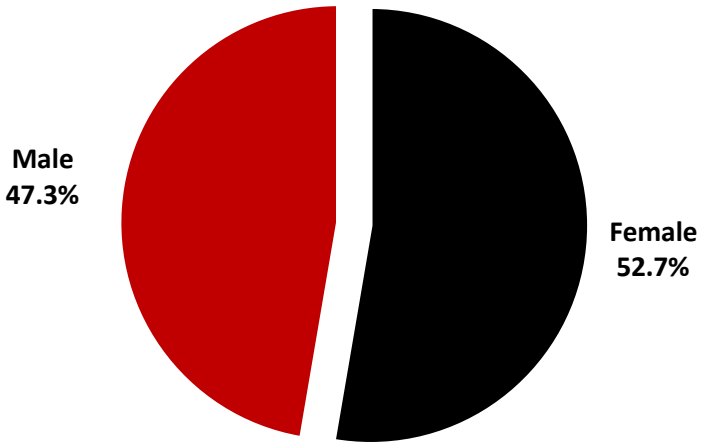
The following figure illustrates the age range of patients treated by ESF from 2014 to 2018.

Figure 19: EMS Responses by Age, 2014–2018



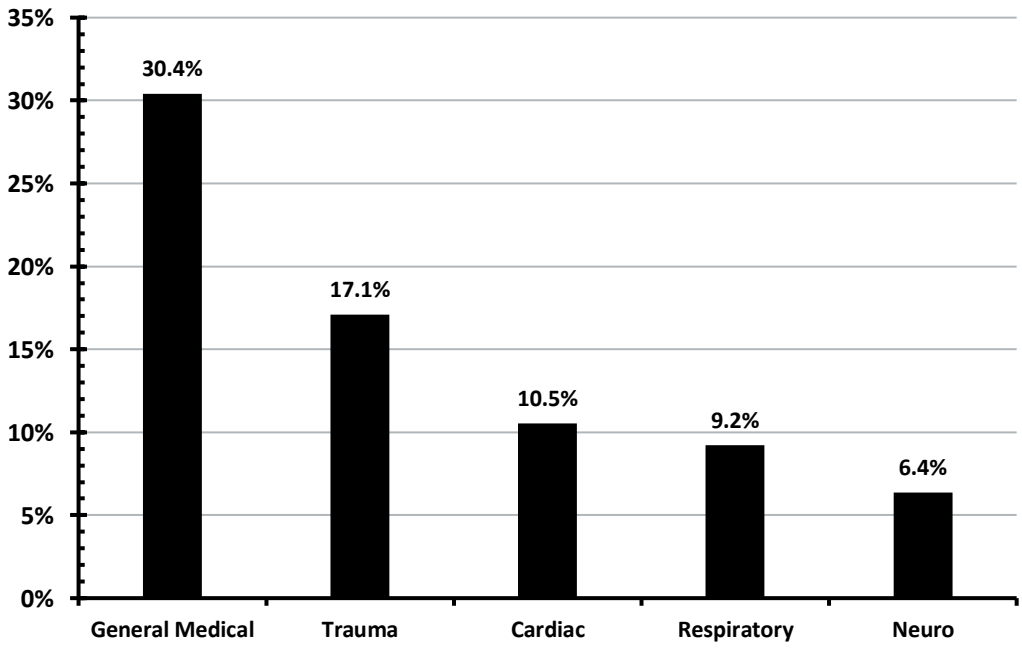
A review of the data shows the majority of ESF's EMS incidents involved patients 61 years old and older (55.9%). Conversely, patients 10 years old and younger were just 1.8% of incident responses. The ratio of male and female patients evaluated is shown in the following figure.

Figure 20: EMS Responses by Gender, 2014–2018



A review of ESF's top five primary medical impressions shows General Medical complaints constituted just over 30% of EMS calls for service, as shown in the following figure.

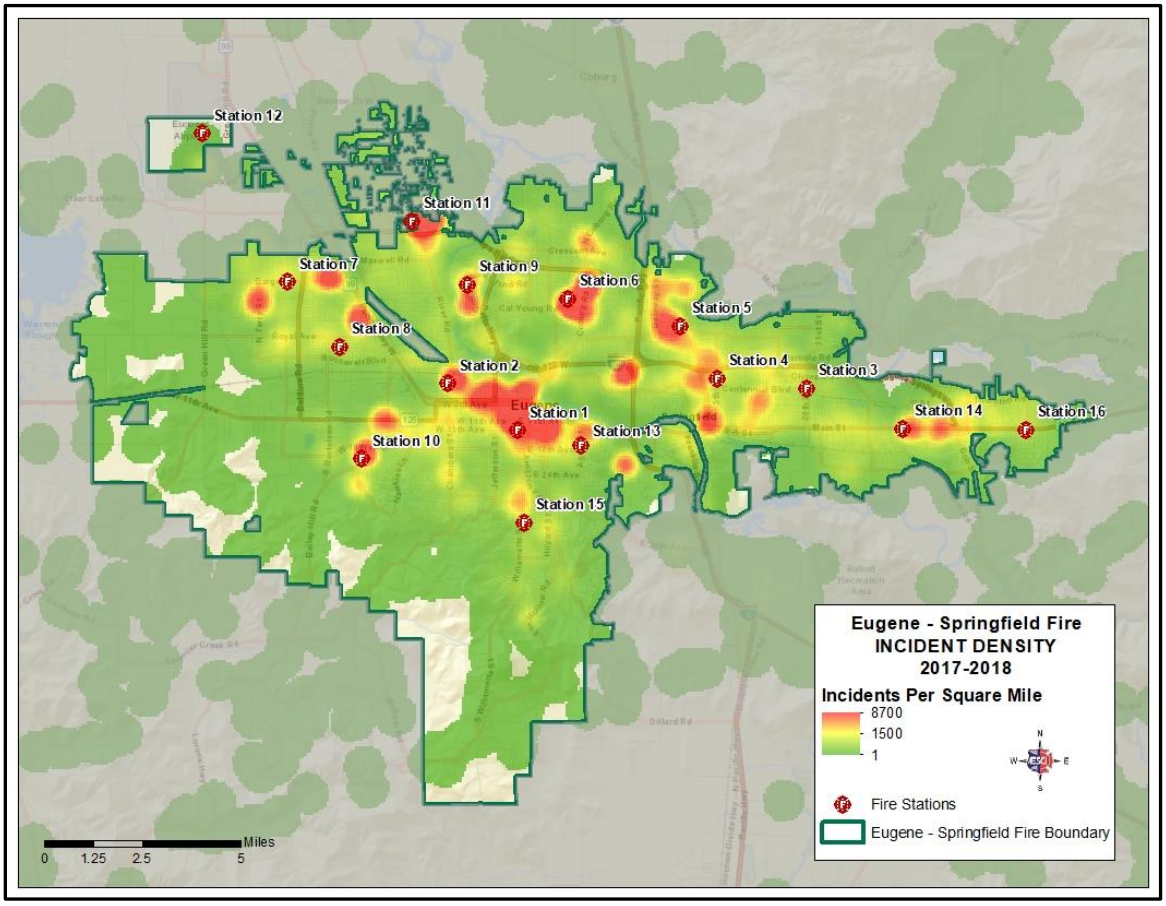
Figure 21: EMS Responses by Primary Impression, 2014–2018



Spatial Analysis of Service Demand

In addition to the temporal analysis of the current service demand, ESCI used GIS tools to analyze and geographically plot 2017 and 2018 incidents to identify service demand density throughout the ESF service area. The following figure illustrates the density for all incidents within the service area.

Figure 22: Incident Density, All Incident Types, 2017–2018

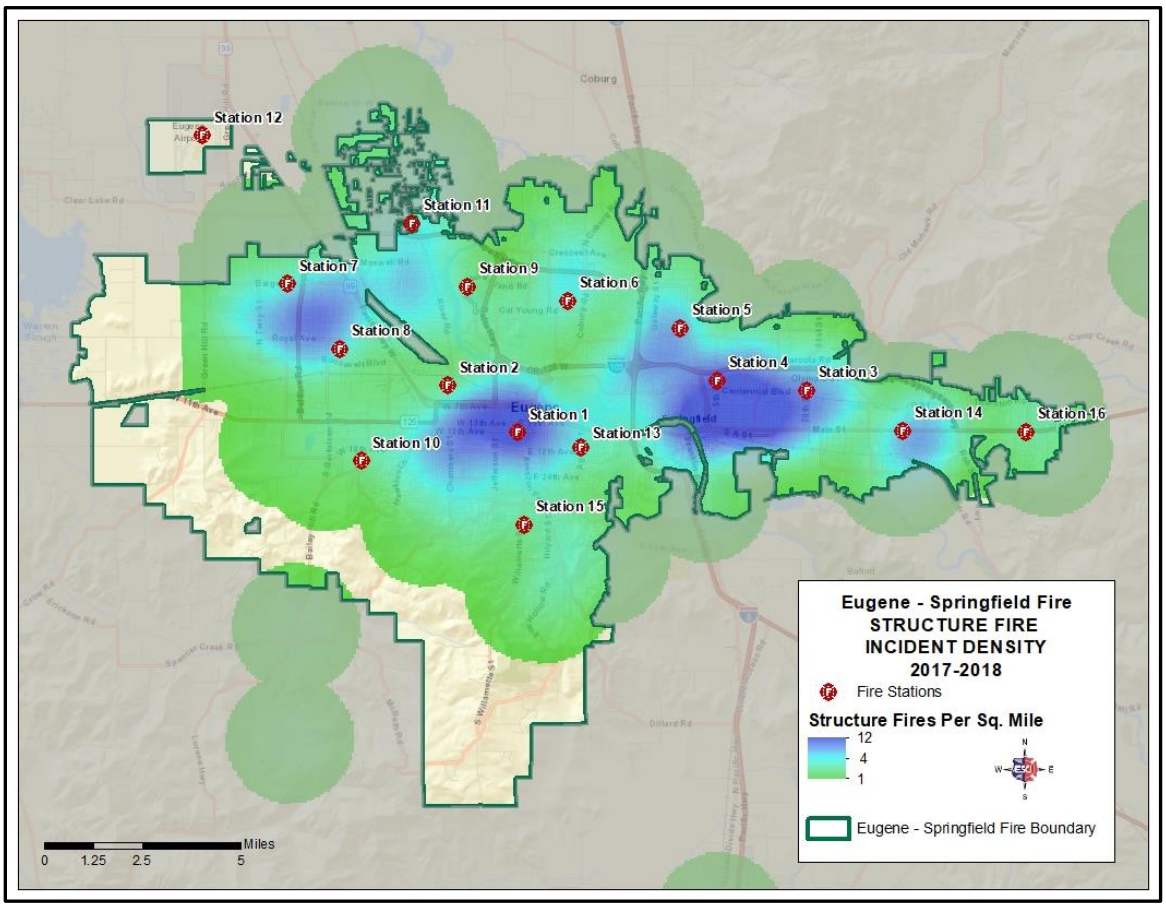


The preceding map shows incident service demand is unevenly distributed, with multiple areas of high call density. The most substantial service demand appears to be slightly east and north of Fire Station 1. This area is on the fringe of the University of Oregon and has a heavy retail footprint. As expected, areas of high incident density are linked to areas of higher permanent and transient population densities.

Fire Incidents

The following figure illustrates structure fire incidents as categorized in the NFIRS reporting system.

Figure 23: Incident Density, Structure Fire, 2017–2018

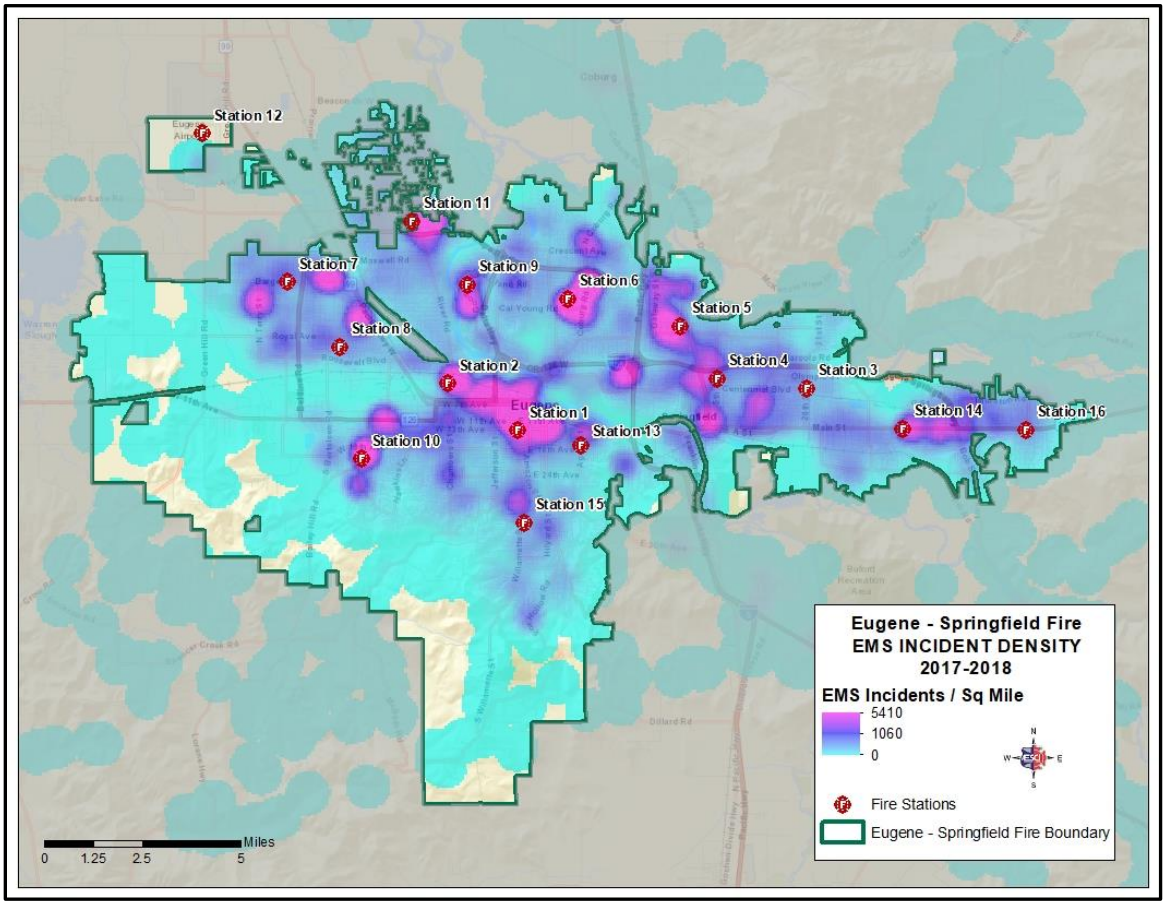


Unlike the all incident density map, fire incidents were grouped in three areas. The area around Station 1 shares a similar pattern to the overall incidents and EMS incidents. However, fire incident density is also shown in the areas between Station 3 and Station 4, along with slightly lower fire incident density between Stations 7 and 8. ESCI noted areas south of Station 11 and near Station 14 that should be monitored to determine if focused fire prevention and education efforts are warranted. Regardless of the distribution of fire incidents, maintaining an initial and effective fire response capability for the entire ESF response area is important.

EMS Incidents

The next figure displays the distribution of EMS incidents throughout the ESF service area.

Figure 24: Incident Density, EMS, 2017–2018



The preceding incident density map reinforces that EMS incidents are the primary driver of service demand in the ESF service area. There are multiple areas of high EMS demand, with the largest located in the Station 1 response zone. In addition, there are approximately 11 to 12 additional EMS "hot spots." ESCI noted that most, if not all, of these areas have fire stations in proximity. Also, these high demand areas are either in or immediately adjacent to the highest population areas.

Other Incidents

The following figure illustrates the incident density for all call types, except fires and EMS. Examples of other call types include odor investigations, smoke alarm activations, hazardous materials spills, electrical hazards, false alarms, citizen assists, etc.

Figure 25: Service Demand Density, Other Call Types, 2017–2018

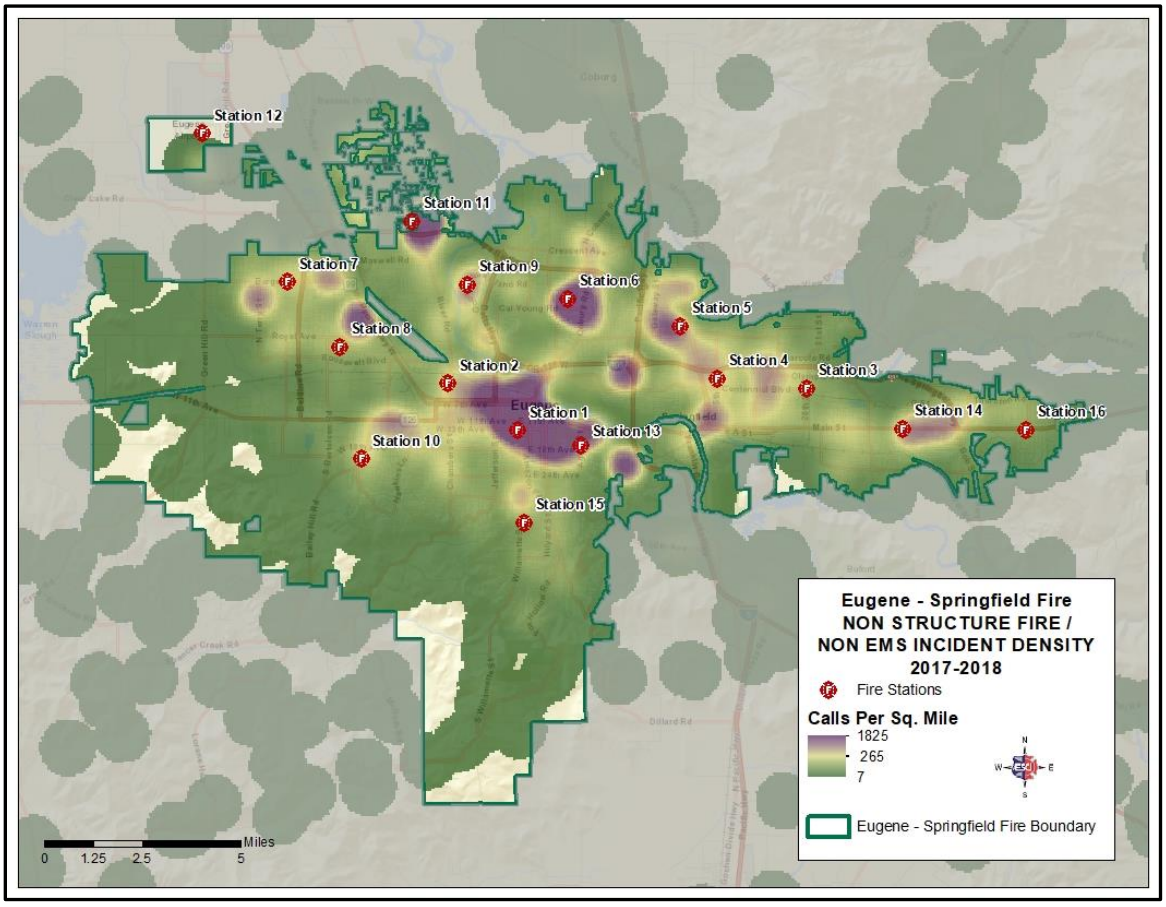


Figure 25 illustrates a similar pattern as the overall incidents and EMS incident maps. The greatest incident density is clustered in the areas between Station 1, Station 13, and southeast of Station 2. These incident density clusters are close to nearly every fire station except for a few outlying stations. Overall, the areas with the most significant number of incidents are incongruent with the structure fire density, yet is congruent with EMS incident density.

Fire Prevention Staffing Survey

Given the integration of delivery areas and built environments into the purview of ESF, ESCI surveyed regional fire departments serving similar-size communities to identify the staffing levels of the respective fire prevention divisions to provide a context in determining the adequacy of the ESF's Fire Prevention Division staffing levels in the newly expanded service area. ESCI created a 14-question web-based survey and sent invitations to 19 fire departments in Washington, Oregon, and California. Six fire departments completed the survey, and the results are summarized as follows:

Question 1: "Are you consulted on proposed new construction/occupancy changes/tenant improvements?"
All six respondents indicated they were consulted in any work of this nature.

Question 2: "Do your inspectors perform existing occupancy inspections?"
All six respondents indicated Inspectors conducted these inspections, and one respondent added their operations crews assisted in these inspections. In that particular department, new fire protection system installations and specialty inspections are performed solely by Fire Inspectors.

Question 3: "What is the frequency of commercial occupancy inspections?"
One respondent noted business inspections were conducted annually, and another indicated a three-year inspection rotation. Two indicated the frequency of inspection depended on the type of occupancy, hazard, and installed fire protection systems. One respondent noted an annual inspection frequency for all commercial structures, but it is not currently achievable.

Question 4: "How many commercial occupancies is your agency responsible to inspect?"
Two respondents have 3,000 inspections, one respondent has 4,000 inspections, and three respondents have 5,000 or more inspections.

Question 5: "List the number of FTEs for the position of Fire Marshal in your organization."
All six respondents indicated they had one FTE for the Fire Marshal's position.

Question 6: "List the number of FTEs for the position of Deputy Fire Marshal in your organization."
All six respondents indicated they had only one FTE for the Deputy Fire Marshal's position.

Question 7: "List the number of FTEs for the position of Fire Inspector in your organization."
One respondent indicated they had two Fire Inspectors, and three respondents indicated they had four or more Inspectors. Two respondents skipped this question.

Question 8: "List the number of FTEs for the position of Fire Investigator in your organization."
One respondent had three Fire Investigators, and three respondents indicated they had four or more investigators. Two respondents skipped the question.

Question 9: "List the number of FTEs for the position of Fire Inspector/Fire Investigator in your organization."

One respondent indicated they had four or more of these combined positions, and five respondents skipped the question. One of the respondents who skipped the question stated that their Deputy Fire Marshal position handles the responsibilities of Fire Investigator and Fire Inspector/Fire Investigator.

Question 10: "List the number of FTEs for the position of Plans Reviewer in your organization."

One respondent indicated they had one Plans Reviewer, and three respondents indicated they had two Plans Reviewers. Two respondents skipped the question. One of the respondents who skipped the question indicated that their Deputy Fire Marshal handles the responsibility of plans review.

Question 11: "List the number of FTEs for the position of Code Enforcement Officer in your organization."

Two respondents indicated they had four or more Code Enforcement Officers, and four respondents skipped the question.

Question 12: "List the number of FTEs for the position of Public Educator in your organization."

Four respondents indicated they had one dedicated Public Educator, and two respondents skipped the question.

Question 13: "List the number of FTEs for the position of Administrative Assistant in your organization."

Three respondents indicated they had one Administrative Assistant, one respondent had had two Administrative Assistants, and one respondent had three Administrative Assistants. One respondent skipped the question.

Question 14: Respondents were asked to indicate the fire/life safety programs delivered by their department.

Fire & Life Safety Course	Number of Depts Offering Courses
Exit Drills in the Home	4
Smoke Alarm Program	6
Carbon Monoxide Program	4
Fire Safety (Chimney, electrical, cooking)	4
Injury Prevention (Falls, burns, bike helmets)	1
Fire Extinguisher Use	4
Fire Brigade Training	0
Elderly Care & Safety	3
School Fire Safety Program	4
Babysitting Classes	0
Juvenile Fire Setter Program	4
Car Seat Inspections	1

Question 15: Open-ended question to solicit for any relevant additional information related to how the departments deliver fire prevention services.
This additional information is noted in the preceding answers.

Fire Prevention Staffing Discussion

A review of the survey found ESF's Fire Prevention Division is very similar in responsibilities and scope of work compared to the respondent departments. ESCI noted ESF had the second-lowest staffing compared to the six respondents, and the respondent with the lowest staffing (6 personnel) had a population 50% less than the ESF population, and a service area that is 154% smaller. **ESF fire prevention staffing is 27% lower than the department with the highest number of fire prevention assigned personnel (11).**

The merging of Springfield fire prevention responsibilities into the new ESF structure resulted in a tremendous increase in building inventory that is now the responsibility of the ESF Fire Prevention Division. A recently completed building inventory identified approximately 17,000 commercial occupancies that fall under the purview of the Division, which is an increase of approximately 10,500 occupancies. This includes Eugene occupancies that were previously unidentified, as well as all of the Springfield occupancies. However, ESCI noted that some of the occupancies listed may actually be individual living or business units within a single structure that should be considered a single large unit.

SECTION 3:

COMMUNITY RISK ASSESSMENT

COMMUNITY RISK ASSESSMENT

This section provides information about the principles and methodologies used in assessing community hazards and vulnerabilities, with the intent of assisting fire department officials in (1) Identifying fire/EMS-related hazards and risks within the communities; (2) Prioritizing risks to develop effective risk reduction strategies; and (3) Determining the appropriate resources necessary to reduce these risks and attain desired outcomes. This assessment relies on the use of both quantitative and qualitative data to identify hazards, risks, and mitigation capabilities in the community.

ESCI intends for this section to provide insight into *what* needs exist, *where* those needs exist, and *how* those needs are expected to change in the future. ESCI utilized physical, economic, and demographic data to assess the various types of hazards and risks that threaten the community, to include:

- Current hazard classification, planning, and mitigation measures from various sources;
- Specific information provided by ESF about target hazards and land use; and
- Planning zones established by ESF.

Methodology

A community risk assessment (CRA) is "the identification of potential and likely risks within a particular community, and the process of prioritizing those risks." This concept is consistent with the FEMA concept of "whole community" and shared responsibility for emergency preparedness.[17] CRA is a critical component of the core capabilities, or phases, of emergency management—prevent, prepare, respond, and recover, as shown in Figure 26.

Figure 26: Emergency Management Components

ESF understands there are hazards in both communities, and these hazards pose a risk to life and property. Also, these hazards vary in likelihood and impact—both on the communities and ESF—and directly influence ESF's planning and response activities.

ESF has expanded the basic risk analysis process to match the "all hazards—all risk" methodologies commonly used in emergency management organizations. In addition to the traditional characteristics of likelihood and community impact, this approach provides qualitative data about the probability and consequences of an incident, plus additional information about warnings, duration, and agency impact.

Unique Community Risk Factors

Every community has risks that are unique to that community. These include population and demographics, natural hazards associated with climate and topography, infrastructure, technological and human-caused hazards, and the types of structures and their intended uses.

Physical Assets Protected

A physical asset is a tangible asset (one that can be seen or touched) that has value. A physical asset can be a parcel of land, a building or structure, personal property or inventory, and vehicles or machines. ESF protects a variety of physical assets. For the purpose of this report, physical assets are real property, buildings, and structures.

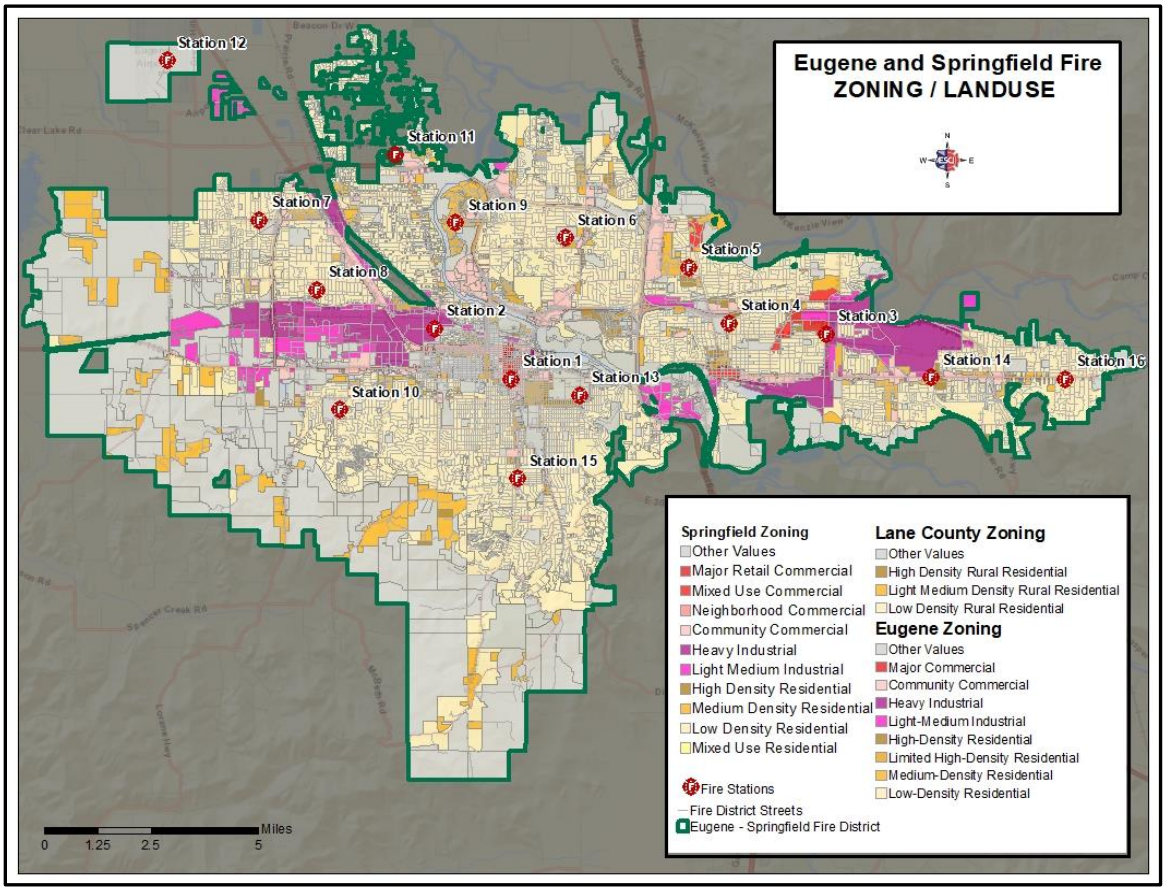
Risk by Land Use Designation

Current and future land use plans have a direct impact on determining the probability and risk of occurrence. Risk is assigned based on the intended use as follows:

- **Low-Risk:** Areas zoned for agricultural purposes, open space, low-density residential, and other low intensity uses.
- **Moderate-Risk:** Areas zoned for medium-density single-family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- **High-Risk:** Higher-intensity business districts, mixed-use areas, high-density residential, industrial, warehousing, and large mercantile centers.

The following figure illustrates the current zoning areas for the cities of Eugene and Springfield.

Figure 27: Land Use/Zoning



As the preceding figure illustrates, low- to high-density residential zoning comprises the majority of the zoning in both cities. Light to heavy industrial zoning is mostly concentrated in the western area in Eugene, and the eastern area in Springfield. However, there are small pockets of industrial zones located in other areas in both cities as well.

Organizational Vulnerabilities

During ESCI's assessment of typical hazards and vulnerabilities in the ESF service area, two key organizational vulnerabilities were identified that could greatly inhibit ESF's ability. First, divergent department administrative and logistics support services and processes; and second, proprietary ESF communications infrastructure and radio system governance.

In identifying these issues, ESCI also referenced a 2009 ESCI consolidation feasibility study for Eugene and Springfield fire departments. Reviewing the overarching recommendation for the integration of the two departments, ESCI stated:

> *Of all of the feasible options discussed above, our preferred choice is an IGA between EFD and SFLS.* ***This is seen as an intermediary step for a vision of a single fire agency via annexation to a fire district.*** (Emphasis added)

Department Structure & Processes

Employees from both Eugene and Springfield comprise the ESF administration and operations divisions. While they operationally deploy in a homogenized fashion and operate under a single set of operating guidelines and collective bargaining agreement (CBA), they are still subject to their respective employer's administrative support processes and rules. Additionally, different bargaining units represent the non-uniformed employees in each city. Local 1148, American Federation of State, County, and Municipal Employees (AFSME) represents Springfield administrative employees. AFSME Local 1714 represents Eugene employees. While the work rules, wages, and benefits for ESF non-uniformed employees are essentially the same, some differences complicate what would be considered normal business practices with a single employer.

A simple example of this is the fact that Eugene employees have a different payroll system and pay schedule than the Springfield employees. This acts as an impediment in the ability to cross-train employees in each organization to perform basic administrative tasks. As a result of these challenges, ESCI understands a Springfield employee was assigned to a newly created Chief of Staff position to help coordinate administrative complexities and needs between the two cities.

Currently, some of ESF's top positions are designated as interim or "Acting in Capacity" (AIC) positions, making it potentially challenging for the organization's leadership—and the department— to move forward in a cohesive, well-supported manner. ESF senior staff members have done an impressive job managing transitions affecting both cities and their respective organizations. ESCI noted both City Managers of Eugene and Springfield, the ESF Fire Chief, and ESF Fire Marshal recently retired. This resulted in the remaining supervisors being placed into "interim" roles and being tasked with additional programmatic responsibilities in addition to their original job duties. While ESCI notes that these personnel are performing admirably in these positions, we are concerned this current management environment may lead to employee burnout and/or confusion about lines of authority and responsibilities among the rank and file members. Adequate staffing is lacking in both the operational and prevention divisions, as noted in the recent (2017) ISO report, and ESCI's analysis.

Emergency Communications

The integration and coordination of fire department radio/data communication systems is another area of ESF organizational vulnerability. Discussions with ESF and Central Lane 911 Communications Center representatives revealed there is little to no coordination, oversight, or planning of the regional fire frequency radio system. ESCI understands that ESF is seeking to upgrade in-house radio communications systems and radio coverage, including securing grants for equipment improvements. However, these efforts are not regionally coordinated or implemented. This lack of coordination may impede expansion, interoperability, and improvements in overall fire radio infrastructure within the Central Lane 911 service area, and may impede effective radio communications in a large-scale disaster situation.

Conversely, ESCI understands regional law enforcement agencies have a strong oversight organization that operates a fully integrated, interoperable, and robust radio communications system, known as the Lane Regional Interoperability Group (LRIG).

DEFINING RISK

It is important to understand and agree upon the methodology of defining risk before a risk assessment may be conducted. For consistency, the following have specific meanings in the context of emergency management and community hazard vulnerability.[18]

Risk

Simply stated, *risk* is the potential that a hazard may become an emergency, and that there will be loss of life or property or damage to the environment.

Likelihood or Probability

Likelihood is the "chance of something happening, whether defined, measured, or estimated objectively or subjectively, or in terms of general descriptors, frequencies, or probabilities."[19]

Consequence or Impact

In this context, ESCI uses the terms *impact* and *consequence* interchangeably. The CPSE definition of consequence is the "effect, impact, or outcome" of some significance; yet goes on to define impact in terms of "the drain effect on the community standards of deployment and coverage capacity when an emergency event occurs." Note that "impact" refers to immediate or acute effects, and "consequence" refers to longer-lasting or chronic effects. Consequences affect one or more of the following aspects of community assets:

- ***Human***—Injury, illness, or loss of life.
- ***Economic***—Loss of income and costs to repair, rebuild, replace, or recover.
- ***Social/cultural***—Damage or loss to sites of historical, cultural, social, or religious significance.
- ***Environmental***—Pollution, loss of habitat.

Hazard

A *hazard* is a condition that presents the potential for harm or damage to people, property, or the environment. Hazards may be interrelated. For example, a hurricane may cause a tornado and flooding that results in a significant release of hazardous materials.

Threat

A *threat* is a hazard that is judged to be in a position to cause harm to people, property, or the environment.

Vulnerability

Vulnerability is an assessment of how well or how poorly protected you are against an event.[20] Vulnerability is influenced by the following factors:

- Predictability
- Temporal distribution
- Spatial distribution and extent
- Physical characteristics
- Shielding or hardening
- Magnitude
- Speed of onset
- Duration
- Resilience

Vulnerability may be reduced by diligent planning, preparation, and mitigation. Examples of these efforts include but are not limited to: Conducting hazard vulnerability assessments, creating emergency response plans, adopting and enforcing building codes, and delivering disaster preparedness public education programs.

A Hazard Vulnerability Assessment (HVA) was conducted with the operational leadership of ESF and the emergency managers of Eugene and Springfield to assist ESCI in quantifying the various hazard risks in the study area. This method was developed by Kaiser Permanente® for use in identifying various hazard risks and mitigation priorities in its health care facilities. Various public agencies and businesses have adopted this approach around the country. The methodology defines risk as a percentage of probability, severity, and preparedness (mitigation). The following figure broadly summarizes, as a percentage of risk, the various hazards found in the ESF service area.

Figure 28: Relative Risk by Hazard Type

	Structure Fire	Non-Structure fire	EMS/Medical	Rescue	HazMat	Natural Hazards	Tech Hazards	Human Hazards	Community Risk Total
Probability	.39	.50	.67	.44	.65	.40	.43	.40.	45%
Severity	.44	.47	.44	.43	.49	.54	.62	.50	49%
Relative Risk	**17%**	**23%**	**30%**	**19%**	**30%**	**22%**	**27%**	**20%**	**22%**

Not surprisingly, the preceding figure shows that EMS/medical situations have the highest probability of occurrence, followed by hazardous materials incidents. Structure fires were scored as having the lowest probability of occurrence. When assessing the impact severity, technology hazards were assessed as having the highest potential community impact, while rescue hazards were deemed to have the least severity. The scoring results for the specific hazards are listed in Appendix A.

In addition to the preceding hazard vulnerability assessment, another hazard assessment methodology was used by ESCI. A qualitative Priority Risk Index (PRI) rating method was used to characterize local risks. The PRI method rates several risk elements and determines an associated weighting factor.

The PRI Matrix used assigns the following categories and brief descriptions for each.

Figure 29: PRI Matrix

PRI Category	Level ID	Description	Index Value
Probability	*Unlikely*	Rare, with no documented history of occurrence	1
	Possibly	Infrequent occurrence, with at least one anecdotal historical event	2
	Likely	Frequent occurrences with at least two or more documented historical events	3
	Highly Likely	Common events with a well-documented history of occurrence	4
Severity	*Negligible*	• Negligible property damage (less than 5% of critical/non-critical infrastructure • No permanent injury/illness disability or deaths • Negligible quality of life impact • Critical facilities off-line for less than 24 hours	1
	Limited	• Slight property damage (between 5% and 25% of critical/non-critical infrastructure) • No permanent injury/illness disability or deaths • Moderate quality of life impact • Critical facilities off-line between one day and one week	2
	Critical	Moderate property damage (between 25% and 50% of critical/non-critical infrastructure)	3
	Catastrophic	Severe property damage (between 50% of critical/non-critical infrastructure)	4
Warning	*Less than 6 hours*	Self-Explanatory	4
	Less than 24 hours	Self-Explanatory	3
	Less than one week	Self-Explanatory	2
	More than one week	Self-Explanatory	1
Duration	*Less than 6 hours*	Self-Explanatory	1
	Less than 24 hours	Self-Explanatory	2
	Less than one week	Self-Explanatory	3
	More than one week	Self-Explanatory	4

The PRI is meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks based on standardized criteria. The application of the PRI results in numerical values that allow identified hazards to be quickly ranked against one another (the higher the PRI value, the greater the hazard risk to ESF). PRI values are obtained by assigning varying degrees of risk (probability, impact, spatial extent, warning time, and duration). Each degree of risk has been assigned a value (1 to 4) and a weighting factor, as summarized below. To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all categories equals the final PRI value, as demonstrated by this equation:

PRI = [(0.45 x P) + (0.3 x S) + 0.15 x W) + (o.1 x D)]

P = *Probability* of the event

S = *Severity* or magnitude of the event

W = *Warning* time, speed of onset

D = *Duration* of event

ESCI also used the PRI rating method to summarize and prioritize the risk of various natural, fire, EMS, technological, and human hazards, as identified in the following sections.

NATURAL HAZARDS & VULNERABILITIES

Since 1955, there have been 16 federally-declared disasters in Lane County, all of which resulted from significant weather events (flooding, straight-line winds, winter storms). In addition, throughout the rest of the state, there were a total of 32 requests for federal disaster assistance, all of which were for drought or wildfire fire management assistance. Although many of these declarations did not directly affect the Eugene and Springfield area, the specific hazards that caused the disasters are present in the study area. The following summarizes the natural hazards present in the region and the ESF service area.

Earthquake

Earthquakes occur throughout the Western United States. Certain areas have a higher probability of experiencing damaging earthquakes. All of the ESF service area is extremely vulnerable to a Cascadia subduction zone earthquake. According to the most recent Eugene-Springfield Area Multi-Jurisdictional Hazards Mitigation Plan, Eugene and Springfield are categorized as having "moderate probability" of a Cascadia Subduction Zone (CSZ) event, a "low probability" of an intraplate event, and "low probability" for a crustal earthquake over the next 100 years. [21] In any of these events, significant damage to community assets and public infrastructure/services, and injuries and fatalities may occur.

There are no known reports of earthquake damage in Eugene and Springfield in recent history. However, there is significant historical evidence of large earthquakes and damage. As a result of advances in earthquake research, and the study and analysis of known faults and related earthquake activity, the probability of the region experiencing a significant earthquake is a reality, and residents and emergency response agencies should plan and prepare for this eventuality.

The soils in the ESF service area present a very low to moderate risk of liquefaction, which may result in significant structural and transportation infrastructure damage due to failing foundations, and settling/collapsing roadways.

Given current earthquake research findings and predictions, along with the region's history of seismic activity, Eugene and Springfield adopted several regulations and codes, most notably the Uniform Building Code Seismic Zone 2b construction practice. However, in 2007 the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted Rapid Visual Surveys (RVS) of 174 structures in the Eugene-Springfield area.[22] Using survey criteria created by FEMA, the survey categorized the collapse potential of a structure during a large magnitude earthquake, which is summarized in the following figure:

Figure 30: 2007 Rapid Visual Survey Results

Low Collapse Risk	Moderate Collapse Risk	High Collapse Risk	Very High Collapse Risk	Total Structures Surveyed
84	56	32	2	**174**

It is important to note that this information is dated, and some of the structures surveyed may have been seismically retrofitted, or may no longer exist. However, the number of structures found to have moderate and high collapse risk is most likely still significant.

According to the 2019 draft Eugene-Springfield Multi-Jurisdictional Hazards Mitigation Plan, several pre-historic Cascadia Subduction Zone earthquakes occurred off the Oregon coast during these approximate years: 1400 BCE, 1050 BCE, 600 BCE, 400 CE, 750 CE, and 900 CE.

Minor earthquake tremors occur in the Eugene-Springfield area fairly frequently, as noted in the following figure:

Figure 31: Recent Eugene-Springfield Earthquakes

Date	Magnitude	Distance from ESF (Miles)
6/24/2019	1.6	7.20
4/18/2019	1.0	5.99
9/28/2018	1.1	2.74
8/19/2018	1.3	12.93
7/29/2018	1.6	2.03
7/10/2018	1.4	4.62
6/26/2018	1.7	2.56
3/07/2018	1.0	5.49
8/11/2017	1.7	15.85
7/03/2017	1.5	15.05
4/21/2017	1.8	3.72
4/10/2017	1.6	3.50
10/18/2016	2.6	8.05
6/17/2016	1.6	4.94
4/11/2016	1.4	5.11
1/02/2016	1.8	8.71

The following figure summarizes the earthquake risk in the ESF service area.

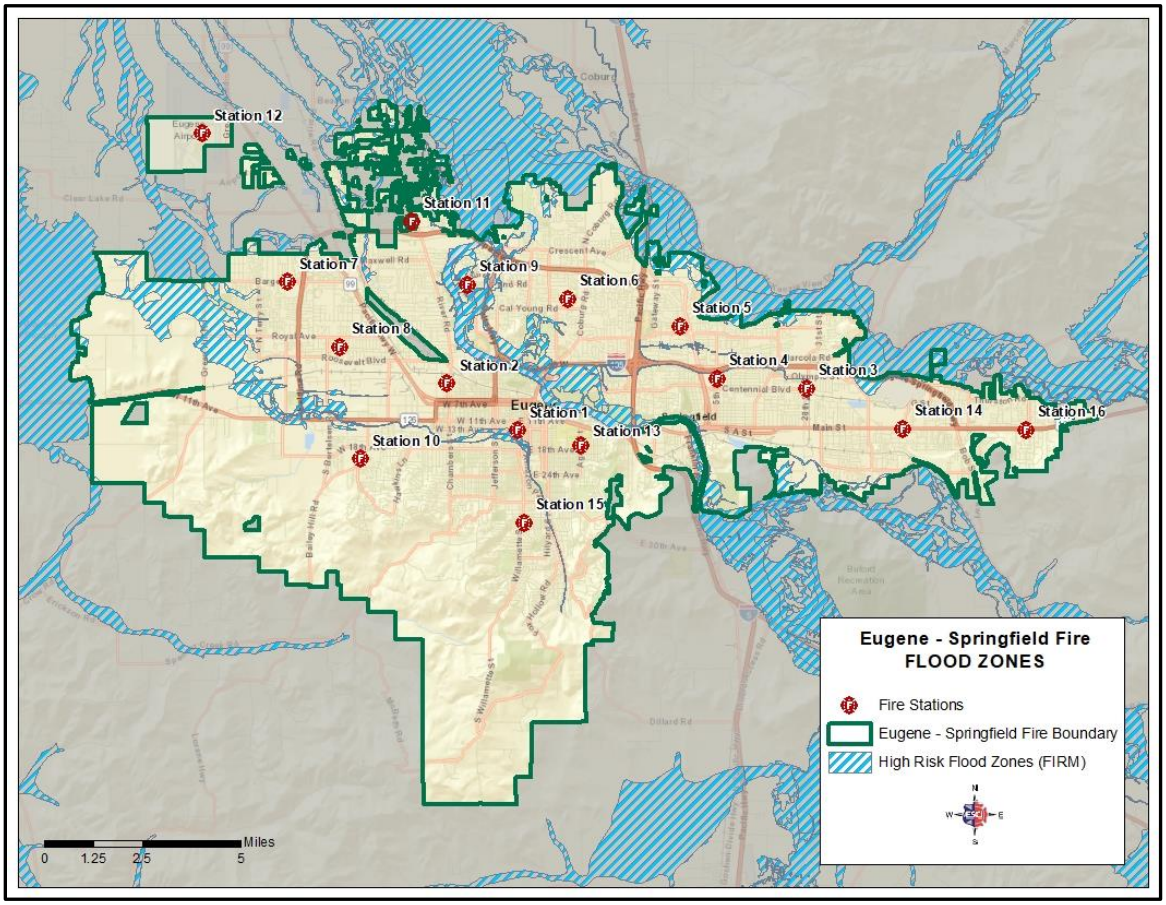
Figure 32: Earthquake PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Limited	Less than 6 hours	More than 1 week	**2.5**

Flooding

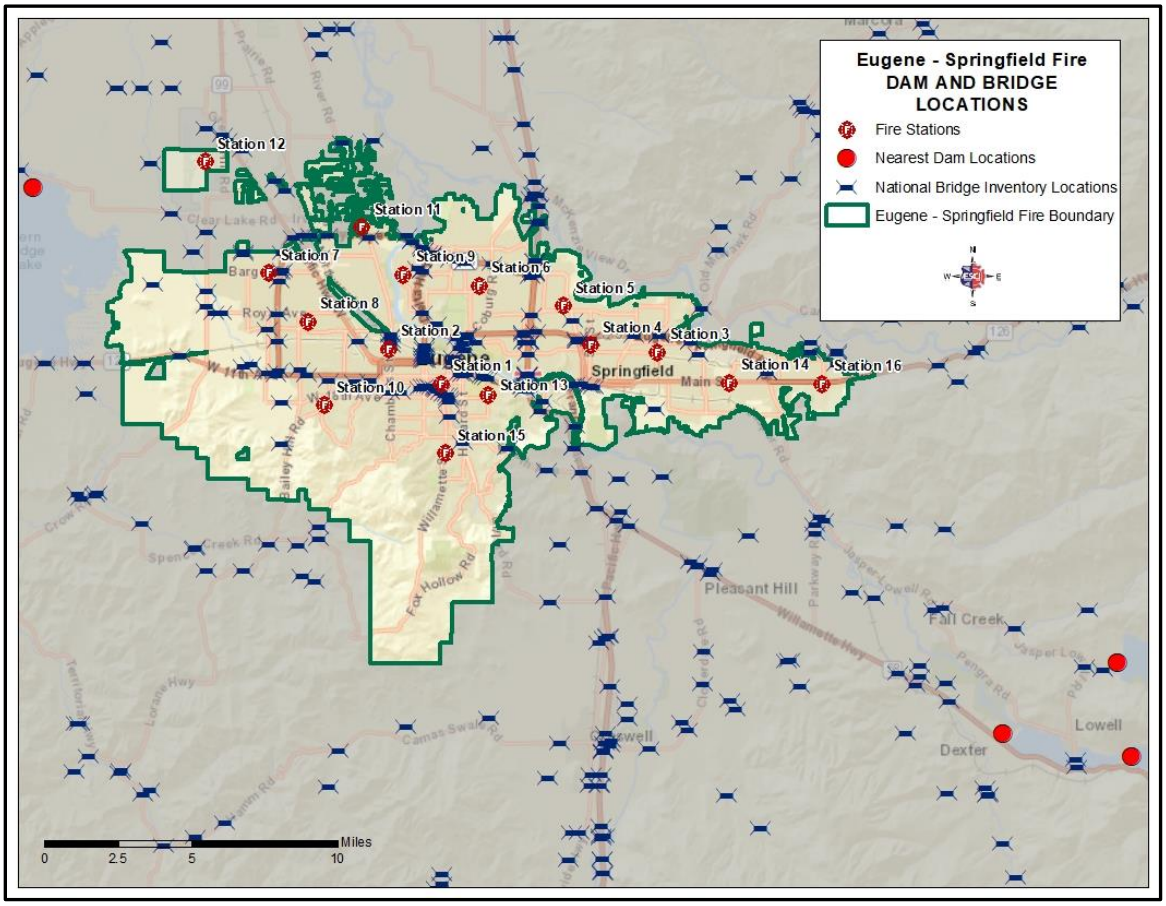
Eugene and Springfield's location and seasonal weather patterns contribute to a significant flood risk, where heavy rains can cause flash flooding and mudslides associated with remnants of tropical storms and post-wildfire conditions. The topography of the study area is comprised of primarily sloping terrain that drains well when exposed to excessive rain and runoff, except in flat, built-up areas. Several creeks, washes, and gullies flow through the ESF service area. The following figure, derived from national flood hazard zone data, illustrates the areas of historical and potential flooding. The light blue striated areas highlight vulnerable areas for significant (100-year) flooding.

Figure 33: Eugene Springfield Flood Zone



Although the likelihood of dam or levee failure is remote, there is flood risk downstream from each of the dams on the outflow sides. Likewise, bridge locations may be the site of flood-related incidents due to high water—road closures, washouts, or risk of people being swept into rising or swift water. The locations of these dams and bridges are shown in the following figure.

Figure 34: Regional Bridge and Dam Locations



Landslide/Mudslide

Landslide is the generic term used to describe the downslope movement of earth materials due to gravity. Landslides may be triggered by earthquakes, extreme precipitation, flooding, or otherwise removing support from the slope. Critical facilities most vulnerable to landslides/mudslides are the roadways, bridges, and culverts along known debris flow areas and hillside cuts. Facilities located downhill of intensely burned wildfire areas are also at an elevated risk to debris flows and mudslides. Underground utility lines are also vulnerable to landslides.

The probability of landslide is moderate in Eugene and moderate in Springfield. Springfield's probability rating is lower because Springfield has fewer dramatic changes in elevation; vulnerability to landslide is low in both cities.[23] The following figure illustrates the landslide/mudslide PRI rating in the ESF service area.

Figure 35: Landslide/Mudslide PRI Rating

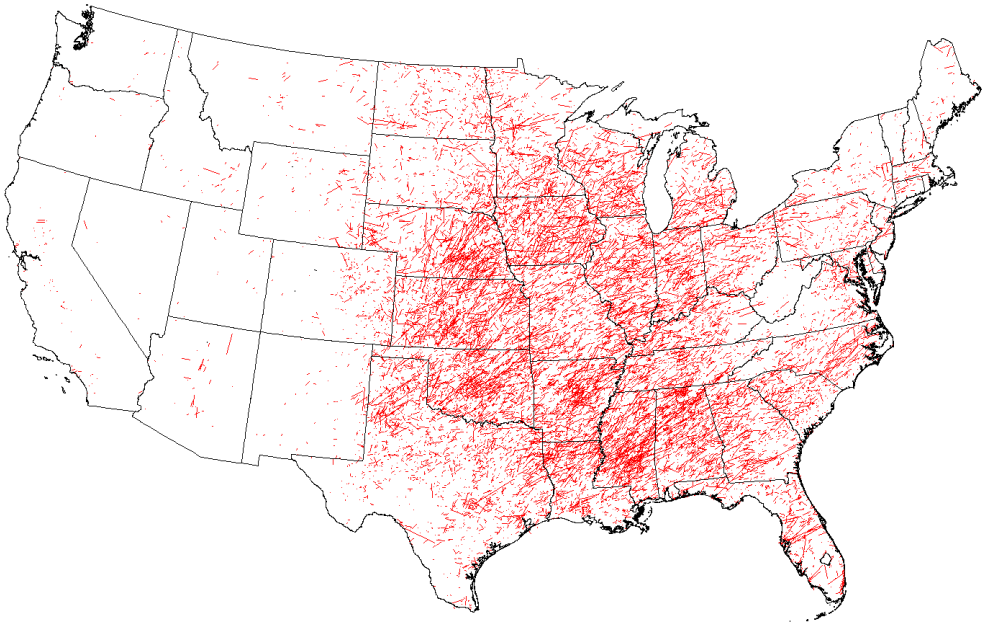
Probability	Severity	Warning	Duration	Rating
Possible	Negligible	6–12 hours	Less than 24-hours	**1.7**

Severe Wind Events

In Eugene and Springfield, severe winds are usually associated with thunderstorms that occur in the spring and summer months, during the transition of cold fronts, or with the passage of the remnants of tropical storms. Damaging winds can take the form of microbursts, straight-line winds, or tornadoes. Of these, tornadoes are the least frequent.

Tornadoes are created when warm, moist air near the ground interacts with cooler air above and rapidly increasing winds that change direction. South Florida, for example, averages about three tornadoes each year. The expectation of a tornado in Eugene and Springfield is very-rare, almost 33 times lower than the U.S. average.[24] However, tornadoes can occur in the broader Pacific Northwest coastal region. For example, an EF-2 tornado touched down in Port Orchard, Washington, in December 2018, causing almost $2 million in damage. Fortunately, there were no injuries or fatalities.[25] The following figure shows the history and paths of tornadoes over the past several decades.

Figure 36: Tornado Activity in the U.S., 1950–2017



The following figure notes the PRI Rating for significant wind events.

Figure 37: Significant Wind Event PRI

Probability	Severity	Warning	Duration	Rating
Possible	Limited	12–24 hours	6–12 hours	**2.15**

Wildfire

Wildfire is defined as an uncontrolled fire spreading through wildland vegetative fuels, urban interface areas, or both, where fuels may include structures. Wildfires are classified as natural hazards, mostly started by lightning, but many are caused by human factors as well. The proximity of development near wildland areas, along with landscaping with indigenous plants in the area creates what is commonly known as the wildland-urban interface, which places these structures at significant risk from an approaching wildfire. Also, the secondary effects of smoke and ash can pose significant threats to air quality and health.

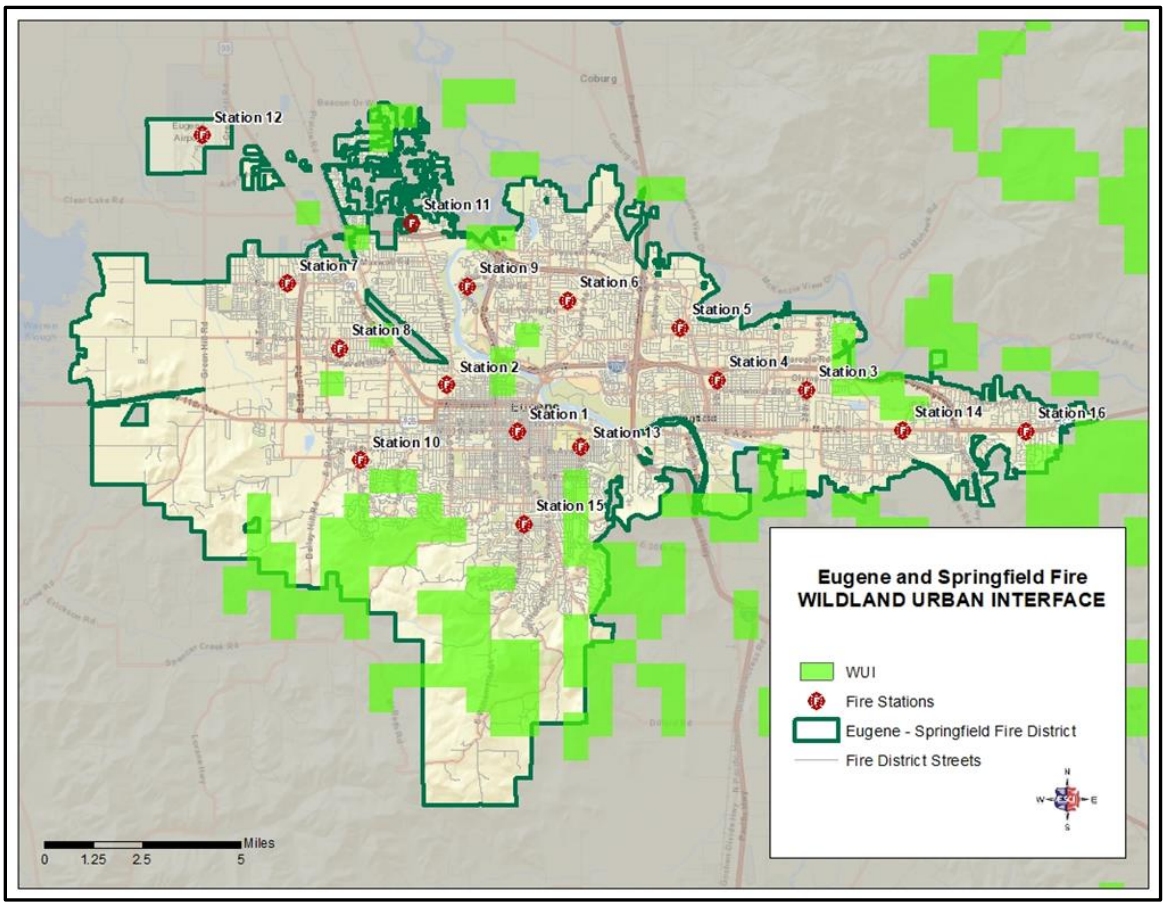
The Eugene-Springfield Multi-Jurisdictional Hazards Mitigation Plan divided wildfires into three categories: Interface, Wildland, and Firestorms.

- Interface fire occurs where wildland and developed areas come together at the wildland-urban interface, with both vegetation and structural fuels.
- A wildland fire's main fuel source is natural vegetation. Often referred to as forest or rangeland fires, these fires often occur in national forests and parks, private timberland, and on public and private rangeland. A wildland fire can become an interface fire if it encroaches into developed areas.
- Firestorms are events of such extreme intensity that effective suppression is virtually impossible. Firestorms often occur during dry, windy weather and generally burn until conditions change, or the available fuel is consumed.

Wildland-Urban Interface Areas

Almost the entire ESF area surrounding the central, developed city cores is in the wildland urban interface. Generally, wildfire vulnerability is greatest in the interface areas with the highest number of houses per acre.

Figure 38: Eugene Springfield Wildland/Urban Interface



Wildland fires are becoming more prevalent in Oregon, along with the rest of the Pacific Northwest, and present an ever-increasing threat to the Eugene Springfield service area. While small wildfires have occurred in the ESF service area, no large wildfires have occurred. However, the cities have significant vulnerable areas of wildland/urban interface, including the southeastern portion of Springfield, and the south hills and southwestern portions of Eugene. These areas have residential development with narrow steep streets intermingled with heavy fuel/forested areas. During the hot summer months when fine dry fuels cure and live foliage moisture drops, these interface areas pose a significant threat for rapid fire growth and potentially catastrophic loss of property and lives.

With that said, a catastrophic wildfire may only affect a relatively small area and population of the overall ESF service area. However, prevailing winds may move heavy smoke into the metro area, potentially affecting many more people, including those with pre-existing respiratory conditions. The following figure identifies the vulnerability related to wildfires in the ESF service area.

Figure 39: Wildfire PRI Rating

Probability	Severity	Warning	Duration	Rating
Likely	Catastrophic	12–24 hours	6–24 hours	**3.2**

In an attempt to mitigate wildfire risk, the federal government created the Firewise USA® program. This program supports homeowner wildfire prevention and mitigation education, as well as provides funding for fuels reduction efforts. ESCI understands that Lane County supports and participates in this program. However, ESF does not currently deliver or participate in Firewise USA.

Winter Storms

Winter storms can include snow, sleet, and freezing rain. Winter precipitation in the region is the "lifeblood of water supply" for Eugene and Springfield. However, severe winter storms that directly impact the ESF service area can cause significant transportation, supply chain, and business disruption, as well as injuries and deaths.

Heavy snowfall and icy conditions can close roads, leaving motorists stranded, and cause multiple-vehicle accidents. These storms can also delay emergency services responses, cause damage to structures and powerlines, and increase the risk of exposure and starvation to livestock and wildlife. Examples of recent winter storm events are summarized in the following figure.

Figure 40: Winter Storm Events

Date	Location	Comments
February 23–26, 2019	Northwest Oregon	Snow and ice event. Federal Disaster Declaration (DR-4432).
February 6–24, 2014	Northwest Oregon	Reports of up to 0.75 inches of ice in Eugene. Federal Disaster Declaration (DR-4169).
January 17–21, 2012	Northwest Oregon	Snow and ice event. Federal Disaster Declaration (DR-4055).
December 2008–January 2009	Southern Willamette Valley	Heavy snow/ice event. Federal Disaster Declaration (DR-1824).

The following figure quantifies the winter storm risk assessment for the ESF service area:

Figure 41: Winter Storm PRI Rating

Probability	Severity	Warning	Duration	Rating
Likely	Limited	12–24 hours	Less than 1 week	**2.7**

Other Natural Hazards

The risk associated with other natural hazards—avalanche, animal disease outbreak, tsunami, and volcanic eruption—are considered negligible and are not included in this risk assessment.

HUMAN-CAUSED HAZARDS & VULNERABILITIES

Medical Hazards

Hazards related to the human condition and activities are the most common and frequent hazards encountered in a community. The following categories summarize the most common human-caused hazards and associated PRI ratings for each.

Typical EMS Response

A typical EMS response refers to pre-hospital medical care rendered on-site by pre-hospital trained specialists. Examples of typical EMS incident types include heart attacks, strokes, respiratory difficulty, vehicular accidents with injury, and other trauma or illness. Typically, medical care is rendered to one patient. However, in the case of a motor vehicle collision, EMS care may be rendered to more than one patient. Some patient conditions require only basic first aid care, while others require basic life support (BLS) or advanced life support (ALS) care. Overall, EMS responses accounted for approximately 75% of all ESF calls for service. The following figure summarizes the typical EMS risk in the ESF service area.

Figure 42: Medical Hazard, EMS Response PRI Rating

Probability	Severity	Warning	Duration	Rating
Highly Likely	Critical	Less than 6 hours	Less than 6 hours	**3.4**

Mass Casualty Incidents (MCI)

Mass casualty incidents are the result of an incident that creates multiple victims that require a significant emergency response to identify, prioritize, treat, and transport victims efficiently for definitive care. Examples of MCI incidents include commercial transportation accidents, passenger train derailments, passenger aircraft crashes, and hazardous materials releases in public areas. The following figure summarizes the MCI risk in the ESF service area.

Figure 43: Medical Hazard, Mass Casualty PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	Less than 6 hours	**2.5**

Pandemic/Infectious Disease

The threat of infectious diseases is present throughout the Eugene Springfield area. Relatively new diseases, such as West Nile Virus, Zika Virus, and SARS are examples of the evolution and migration of diseases around the world. Two terms are used to define the proliferation of disease: *Epidemic* and *Pandemic*. An epidemic is a disease that has spread among a large number of people in a community—or number of communities/regions—in a short time frame. A pandemic is defined as the spread of a disease around the world. A relatively recent example of a pandemic was the 2009 H1N1 "Swine Flu" Pandemic, a novel virus that is estimated to have killed between 151,700–575,400 people worldwide.[26]

Disease impacts all populations in areas of the world, and all areas are vulnerable to epidemics. The probability of an epidemic or pandemic infectious disease that affects the population in Eugene and Springfield is possible due to the mobility enabled by regional and international travel. However, due to robust public health surveillance, education, and subsequent mitigation efforts, most infectious disease outbreaks would likely remain small, and not pose a major threat to the entire ESF populace. Mitigation strategies include focused public messaging and education, practicing basic personal hygiene and isolation techniques, and diligent public health department surveillance. The following figure summarizes the pandemic/infectious disease risk in the ESF service area.

Figure 44: Medical Hazard, Pandemic/Epidemic PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	More than 24 hours	More than 1 week	**2.5**

Structure Fires

Residential Structure Fires

This category refers to fires located in one- or two-unit buildings constructed for single-family living. Fires in these types of structures are well within ESF response capabilities. Residential structures include, but are not limited to, the following:

- Mobile homes and manufactured housing
- Single-family dwellings
- Duplexes

The following figure summarizes the residential structure fire risk in the ESF service area.

Figure 45: Structural Fire Hazard, Residential PRI Rating

Probability	Severity	Warning	Duration	Rating
Likely	Limited	Less than 6 hours	Less than 6 hours	**2.65**

Large Structure Fires

This category refers to fires located in large buildings constructed for public and business use, manufacturing, storage, and multi-family residential living. The ample square footage, number of occupants, and nature of use increase the potential for the large loss of life and property damage. Large structure fires require a significant number of firefighters, apparatus, and other resources to extinguish, and may require additional resources beyond what is typically available through ESF. The large structure fire category includes, but is not limited to, the following occupancy types:

- Places of Assembly (e.g., theaters, meeting and dance halls, bars, clubs, and restaurants with 50+ occupants, conference centers, stadiums, churches, auditoriums, arenas, etc.)
- Shopping centers/malls
- Mid and high-rise office buildings
- Multi-family dwellings
- Assisted living facilities
- Hotels
- College dormitories
- Hospitals
- Schools

The following figure summarizes the large structure fire risk in the ESF service area.

Figure 46: Structural Fire Hazard, Large Structures PRI Rating

Probability	Severity	Warning	Duration	Rating
Likely	Limited	Less than 6 hours	6–12 hours	**2.75**

High-Risk Structure Fires

This category refers to fires associated with specialized industrial, manufacturing, or storage operations in which large amounts of hazardous materials, lumber, or other flammable/combustible materials are present. Significant involvement in this structure type may exceed ESF's capacity and capabilities, and require additional outside resources. High-risk structures include, but are not limited to, the following:

- Manufacturing facilities
- Chemical storage facilities
- Bulk fuel facilities
- Tire storage facilities
- Large vacant buildings

The following figure summarizes the high-risk structure fire risk in the ESF service area.

Figure 47: Structural Fire Hazard, High-Risk Structures PRI Rating

Probability	Severity	Warning	Duration	Rating
Likely	Limited	Less than 6 hours	Less than 6 hours	**2.65**

Urban Conflagration

An urban conflagration is a very large, rapidly spreading fire involving multiple structures. In the ESF service area, the risk of this type of fire is highest in the wildland-urban interface around the ESF service area, and dense older commercial and residential neighborhoods with combustible buildings that do not meet contemporary fire codes and do not have built-in fire protection systems. The urban conflagration vulnerability for the service area is summarized below.

Figure 48: Structural Fire Hazard, Urban Conflagration PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	6–24 hours	**2.6**

Special /Complex Hazards

Complex Extrication/Heavy Rescue

This is most commonly associated with motor vehicle incidents that involve trapped patients. Industrial accidents may also require this type of response, both of which require specialized training and equipment.

Figure 49: Technical Rescue Hazard, Extrication PRI Rating

Probability	Severity	Warning	Duration	Rating
Highly Likely	Critical	Less than 6 hours	Less than 6 hours	**3.4**

Structure Collapse

This is predominantly a problem in older communities where several large structures predating modern building codes are still in use by the public. It also includes abandoned buildings that have not been secured or torn down, and buildings under construction, remodeling, or demolition. Significant roof loading due to standing water or snow may also cause structural collapse.

Response to these types of incidents often requires specially trained personnel, equipment, and outside expertise (structural engineers, for example). The following table summarizes the risk of structural collapse in the ESF service area.

Figure 50: Technical Rescue Hazard, Structural Collapse PRI Rating

Probability	Severity	Warning	Duration	Rating
Unlikely	Limited	Less than 6 hours	Less than 1 week	**1.95**

Other Technical Rescue

This refers to the specialized rescue of victims from a wide range of situations and environments, including elevators, swift water, water, confined spaces, elevated locations and terrain (low and high-angle), or any combination. Specially trained responders must utilize various specialized equipment specific for the type of situation encountered. ESF has the necessary trained personnel and equipment to complete a successful rescue in these scenarios. If needed, additional specialized equipment could be requested through mutual aid. Examples of specialized rescue include:

- Multiple rising or swift water rescues during floods
- Large-scale evacuations during earthquakes, severe weather, or other large incidents
- Elevator, trench, agricultural, or confined space
- High-angle rope rescue
- Urban or rural search and rescue

The following figure summarizes the PRI Rating for various other technical rescue risks in the ESF service area.

Figure 51: Technical Rescue Hazard, Other PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	Less than 6 hours	**2.5**

Deliberate Violent Acts

Unfortunately, in today's world, terrorism, violence, or deliberate criminal act is a reality that must be considered. A significant attack can occur at any time in businesses, places of worship, schools, public buildings, factories, or sports venues.

Attractive targets for terrorism include critical facilities, communication systems, water and utilities, monuments, and areas where large groups congregate (e.g., University of Oregon sports complexes, Autzen Stadium, performance venues, religious venues, and the Lane Events Center). Mitigation strategies include consistent public awareness/education efforts, planning, continuous surveillance and intelligence gathering by law enforcement and homeland security officials, and periodic drills and deployment of law enforcement and other public safety assets.

Fortunately, federal, state, and local law enforcement agencies, along with ESF and other emergency response organizations have a long history of large-scale sporting event planning and execution. This has resulted in well-established plans and interagency relationships that result in fairly uneventful operations during these events. The following figure summarizes the terrorism risk in the ESF service area.

Figure 52: Deliberate Violent Act: Terrorism-Related PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	More than 1 week	**2.8**

Infrastructure Emergencies

Dam/Levee Failure

The primary risk associated with dams and levees is a failure due to extreme water flow and poor maintenance. While dam and levy failures often occur slowly, providing ample warning time, a significant earthquake may cause immediate and catastrophic failure with little to no warning. The locations of dams, levees, and bridges that may impact the ESF service area is shown in Figure 34. The following figure shows the dam/levee failure vulnerability in the ESF service area.

Figure 53: Dam/Levee Failure PRI Rating

Probability	Severity	Warning	Duration	Rating
Unlikely	Catastrophic	More than 24 hours	Long	**2.2**

TECHNOLOGICAL HAZARDS & VULNERABILITIES

Transportation Emergencies

Aircraft Crash

Eugene Airport, also known as Mahlon Sweet Field, is a public airport located 7 miles to the northwest and is owned and operated by the City of Eugene. Eugene Airport is the fifth-largest airport in the Pacific Northwest and features a terminal, ticketing, and baggage claim. The airport has an expanded air cargo facility and three fixed-base operators to handle general aviation. The airport is the second busiest airport in Oregon for commercial passengers.

A crash involving a large passenger aircraft may create a mass casualty incident with potentially hundreds of injuries or deaths. Hazardous materials releases may also result due to fuel spills and dangerous cargo container damage. The crash of a military aircraft with munitions or classified material presents special challenges and may require the support of explosive ordinance disposal teams and military security personnel. The following figure summarizes the aircraft crash risk.

Figure 54: Aircraft Crash PRI Rating

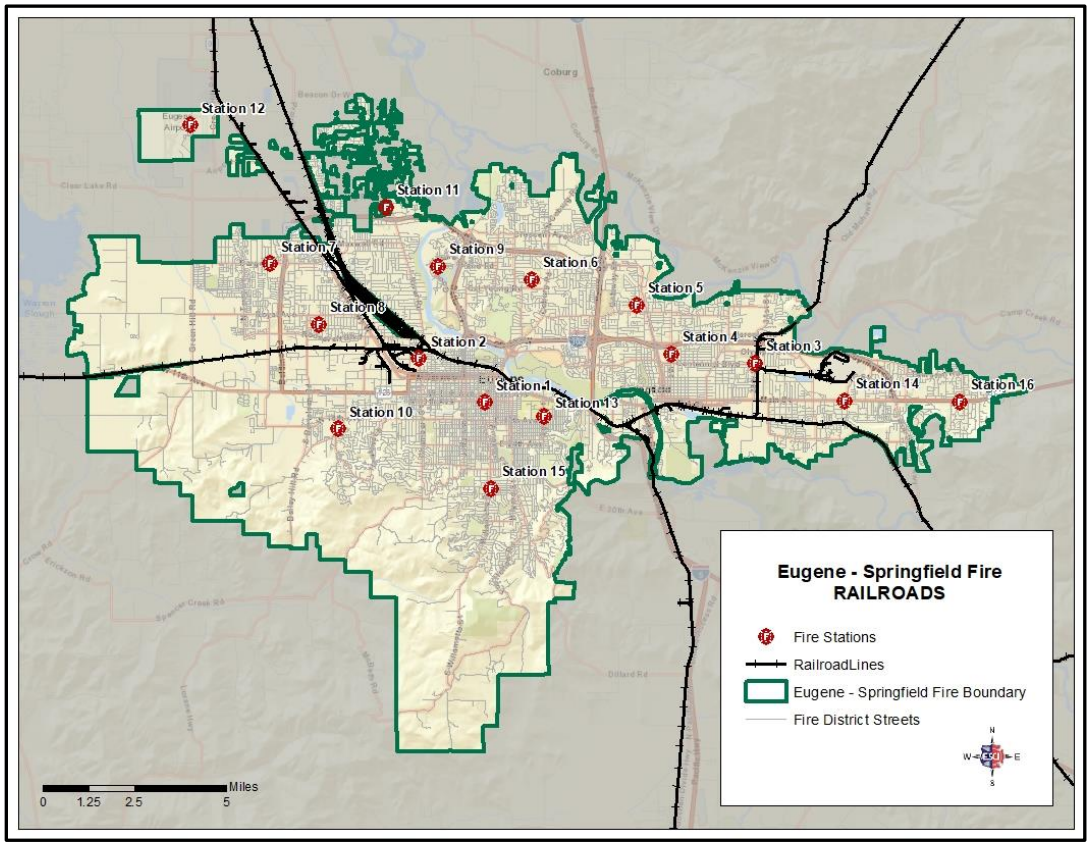
Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	Less than 6 hours	**2.5**

Train Derailment

Freight and passenger rail lines crisscross the ESF service area. The greatest risk associated with freight trains is a large spill of dangerous hazardous materials. Examples of the large quantities of dangerous cargo carried by rail include liquified petroleum gas (LPG), chlorine, acids, and crude oil.

Amtrak passenger trains also travel through the ESF service area. Derailment or collisions with other transportation vehicles may result in a large-scale mass casualty incident. The following figure maps the location of the rail corridors in the ESF service area.

Figure 55: Railroad Network



The following figure summarizes the train derailment risk in the ESF service area.

Figure 56: Train Derailment PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	Less than 1 week	**2.70**

Pipeline Emergency

Two large natural gas and liquid petroleum pipelines pass through the ESF service area. The Williams high-pressure natural gas pipeline feeds the region, and the Kinder Morgan pipeline provides fuel and other petroleum commodities to their tank farm. Smaller low-pressure natural gas distribution lines are present in commercial and residential areas. The Williams Pipeline that crosses over the McKenzie River is a special concern for emergency planners, as it is thought to be vulnerable to rupture during a significant earthquake. However, most damage and rupture of underground pipelines are the result of third-party damage during excavation work. The following figure summarizes the underground pipeline emergency risk in the ESF service area.

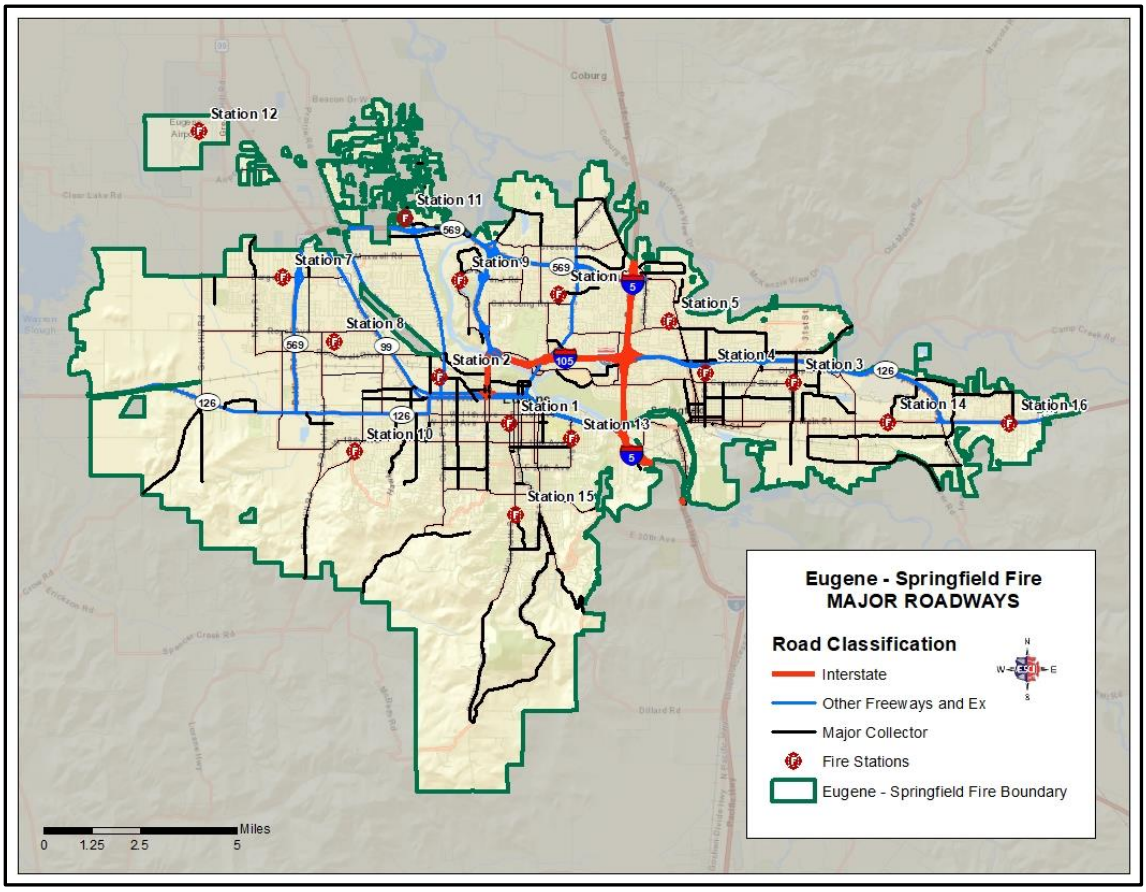
Figure 57: Pipeline Emergency PRI Rating

Probability	Severity	Warning	Duration	Rating
Unlikely	Critical	Less than 6 hours	6–24 hours	**2.15**

Vehicle Incident/Fire

The Eugene Springfield service area has a major freeway, highways, and thoroughfares. The following figure illustrates these major routes.

Figure 58: Major Roadway Corridors



- **Interstate 5**: Interstate 5 forms much of the eastern city limit, acting as an effective, though unofficial, boundary between Eugene and Springfield. To the north, I-5 leads to the Willamette Valley and Portland. To the south, I-5 leads to Roseburg, Medford, and the southwestern portion of the state. In full, Interstate 5 continues north to the Canadian Border at Blaine, Washington and Vancouver, British Columbia, and extends south to the Mexican border at Tijuana and San Diego. Oregon Route 126 is routed along the Eugene/Springfield Highway, a limited-access freeway. The Eugene portion of this highway begins at an interchange with Interstate 5 and ends two miles (3 km) west at a freeway terminus.
- **Delta Highway**: The Delta Highway forms a connector of fewer than 2 miles (3.2 km) between Interstate 105 and Beltline Highway.
- **Oregon Route 99**: Oregon Route 99 forks off Interstate 5 south of Eugene and forms a major surface artery in Eugene. It continues north into the Willamette Valley, parallel to I-5. It is sometimes called the "scenic route" since it has a great view of the Coast Range and stretches through many scenic farmlands of the Willamette Valley.

Traffic is heavy throughout the service area, so the likelihood of a collision or vehicular fire is high. Incidents can range from a minor "fender bender" to a multi-vehicular incident with fire, injuries, and fatalities. The vehicle incident/fire vulnerability for the ESF service area is shown in the following figure.

Figure 59: Vehicle Incident PRI Rating

Probability	Severity	Warning	Duration	Rating
Highly Likely	Critical	Less than 6 hours	Less than 6 hours	**3.4**

Infrastructure Failures

Water Supply Failure

Widescale water supply failure is generally a consequence of a large disaster, such as a hazardous materials contamination of the water source. Given that a large portion of the ESF service area obtains its potable water from the McKenzie River, there is significant concern about contamination due to an adjacent transportation accident involving hazardous materials that migrate into the river. When this type of emergency occurs, citizens will need significant assistance to ensure access to a safe water supply. Water supply failure is a major concern for ESF, Eugene, and Springfield emergency managers.

Figure 60: Water Supply Failure PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Catastrophic	Less than 6 hours	Less than 1 week	**3.0**

Power Failure

The power grid in Eugene and Springfield is considered fairly robust, with many inherent redundancies. However, given the complexity and presence of this system in all facets of the ESF community, local, short-term outages are not uncommon, especially during severe weather. Region-wide failures are less common but often result in greater long-term impacts on citizens, health care, businesses, and public safety. This is especially true during severe winter storms that impact the entire Willamette Valley region. The following figure summarizes the power outage risk in the ESF service area.

Figure 61: Power System Failure PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Critical	Less than 6 hours	Less than 1 week	**2.7**

Internet/Data Transmission Failure

Today, government, business, and pubic infrastructure depend on reliable and robust internet and data transmission capabilities to conduct business. There are several information technology and data transmission providers in the ESF service area, including cable companies, telecommunication/voice providers, and satellite network providers, all of whom provide essential hardwire and wireless communication capabilities for the community, as well as emergency personnel. The following figure summarizes the data transmission risk in the ESF service area.

Figure 62: Data Transmission Failure PRI Rating

Probability	Severity	Warning	Duration	Rating
Possible	Limited	Less than 6 hours	6–24 hours	**2.3**

Operational Failures

HazMat Release

The release of dangerous chemicals can occur throughout the ESF service area, either during transport or while being used or stored for industrial purposes. Hazardous materials spills and releases require specially trained and equipped personnel to contain, control, and remove the materials safely.

Each day, over the road trucks, rail cars, and delivery vehicles carry tons of dangerous chemicals throughout the ESF service area, as well as the large diameter Williams underground natural gas pipeline and the Kinder Morgan liquid petroleum product pipeline.

In addition, 37 facilities have been identified in the City of Eugene with sufficient quantities of hazardous materials to require filing of a Tier II report and monitoring by the Eugene Toxics Right-To-Know Program.[27] Some retail outlets, notably "big box" stores and wholesale outlets, carry quantities of hazardous materials packaged for consumer purchase. Safety Data Sheets (SDS) and related information are required to be available on-site. In addition, some companies also list SDS information on the company's website. The following figure lists the hazmat release risk in the ESF service area.

Figure 63: Hazardous Materials Release PRI Rating

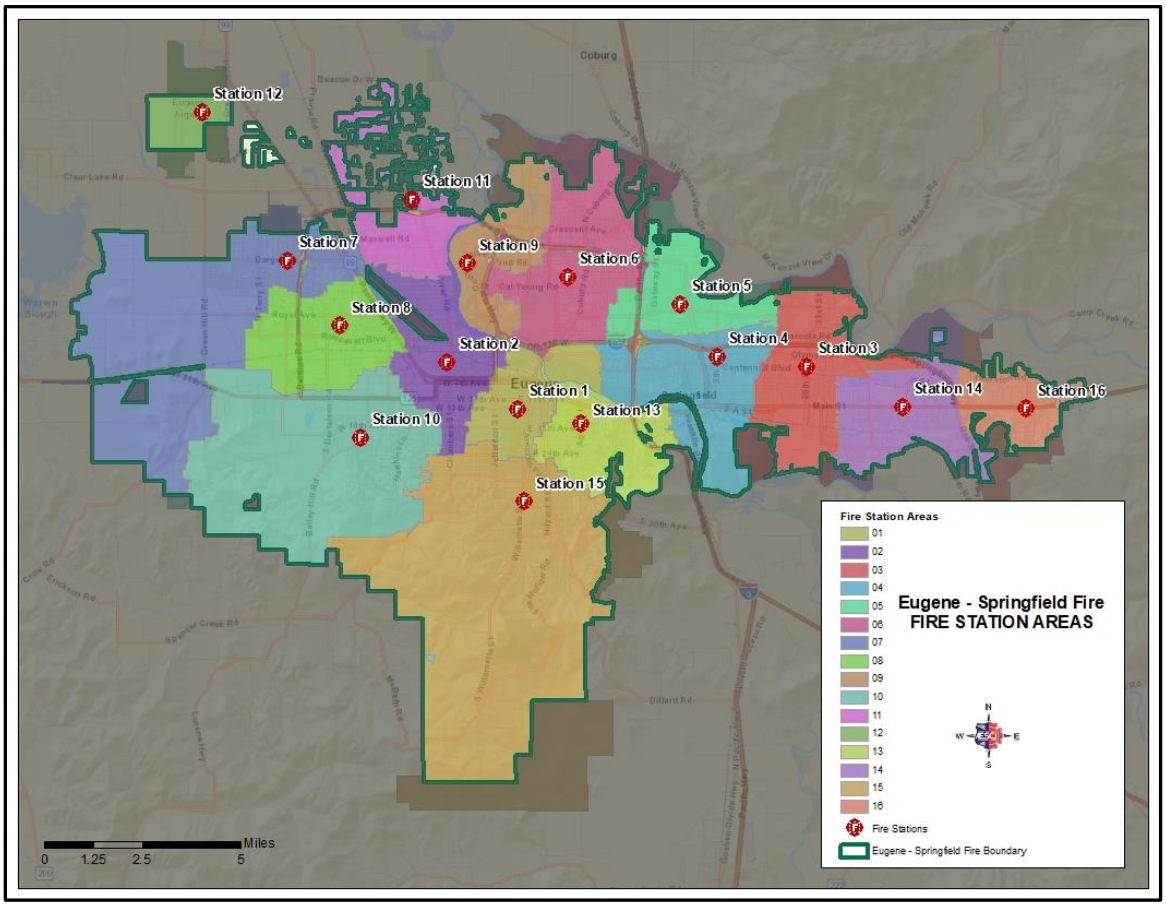
Probability	Severity	Warning	Duration	Rating
Likely	Limited	Less than 6 hours	6–24 hours	**2.75**

RISK BY GEOGRAPHICAL PLANNING ZONE AND INCIDENT TYPE

Fire Planning Zone Methodology

For fire and EMS emergency response, ESF created response/planning zones, as shown in the following figure. For the purposes of this study, ESCI used these planning zones to assist in quantifying risk, response resources, and historical incident data and trends.

Figure 64: Fire Planning Zones



Target Hazard Locations

Risk by IBC Occupancy Group (Risk-Based Occupancy Model)

Individual buildings or building complexes are categorized by the risk associated with the intended use of the building(s) as defined by the International Building Code (IBC). The following figure summarizes the IBC occupancy categories and associated PRI Risk.

Figure 65: IBC Occupancy Categories and PRI Risk

PRI Risk	IBC Group	Examples
High	A-1, A-2	Nightclub, restaurant, theater, airport/cruise ship terminal
	A-3, A-4, A-5	Arenas, museums, religious
	H-1, H-2, H-3, H-4, H-5	Hazardous materials sites (Tier II)
	B	All government & public buildings, other office buildings over 2 stories
	E	Schools, day care centers
	I-1, I-2, I-3, I-4	Hospitals, assisted living centers, correctional
	M	Strip centers, closed-air shopping malls, big box stores
	R-1, R-3	Hotels, motels, dormitories, apartments, board & care
	Special Risk (Target hazard)	Railroads, Interstate highways, airports
		Any building with life safety risk beyond reach of preconnected hose lines > 200 feet
Moderate	B	Outpatient clinics, general business, offices < 3 stories
	F-1	Fabrication or manufacturing of combustible materials
	M	Mercantile, free-standing
	I-2, R-4	Foster group homes, assisted living homes
	S-1	Storage of combustible materials, car repair, hangars
Low	F-2	Fabrication or manufacturing of non-combustible materials
	R-1, R-2	1- and 2-family dwellings, foster homes
	S-2	Storage of combustible materials
	U	Barns, silos, other unclassified

Specific Structural Target Hazards

A **target hazard** is a location where the type and use of the building presents a greater hazard and risk to life, property, or the environment. High occupancy buildings, facilities providing care to vulnerable populations, industrial buildings housing high-risk operations, and hazardous materials storage facilities are just a few examples of target hazard locations that may present significant safety issues and control challenges during an emergency response. ESF has identified several target hazard buildings, including places of public assembly, schools and childcare centers, medical and congregate-care facilities, residential care facilities, high-rise apartment buildings, high-rise office buildings, and critical public infrastructure/utilities. Information provided by the recently completed occupancy inventory was reference by ESCI in developing this section of the study.

Vulnerability Impact Assessment

For this report, ESCI analyzed the impact of a large fire on each category of target hazard as follows:

- **Human:** Significant injuries and deaths.
- **Physical:** Property damage to buildings, infrastructure, and other physical property.
- **Social:** Interruption of social services, and psychological effects.
- **Economic:** Interruption of business, cascading effect on the community and economy.
- **Environmental:** Effects on environmental quality.

Each vulnerability was rated:

- **Low:** Minor consequences, no significant injuries, slight impact on core functions and processes for a short period.
- **Moderate:** Moderate to serious consequences, few significant injuries or deaths, impairment of core functions and processes for up to 1 year.
- **High:** Severe consequences, with large loss of life or severe injuries, interruption of primary services, or major loss of core processes and functions for an extended period.
- **Catastrophic**: Extremely severe consequences, with very high loss of life and significant community impact or permanent loss.

Examples of identified target hazards, along with vulnerability assessment observations by the ESCI assessment team, appear in the following figures.

The following information and figures are not intended to list all buildings of a given type or occupancy. Rather, the locations included here have been identified by ESF for a potentially significant vulnerability in one or more of the vulnerability factors listed previously (human, physical, social, economic, or environmental). This list is subject to change given specific characteristics as determined by ESF.

Critical Infrastructure and Key Resources

The term *critical infrastructure and key resources* (CIKR) describes resources essential for the functioning of a society and economy. Critical infrastructure is defined as a sector "whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof." There are sixteen defined Critical Infrastructure Sectors (CIS):[28]

- Chemical
- Commercial Facilities
- Communications
- Critical Manufacturing
- Dams
- Defense Industrial Base
- Emergency Services
- Energy
- Financial Services
- Food and Agriculture
- Government Facilities
- Healthcare and Public Health
- Information Technology
- Nuclear Reactors, Materials, and Waste
- Transportation Systems
- Water and Wastewater Systems

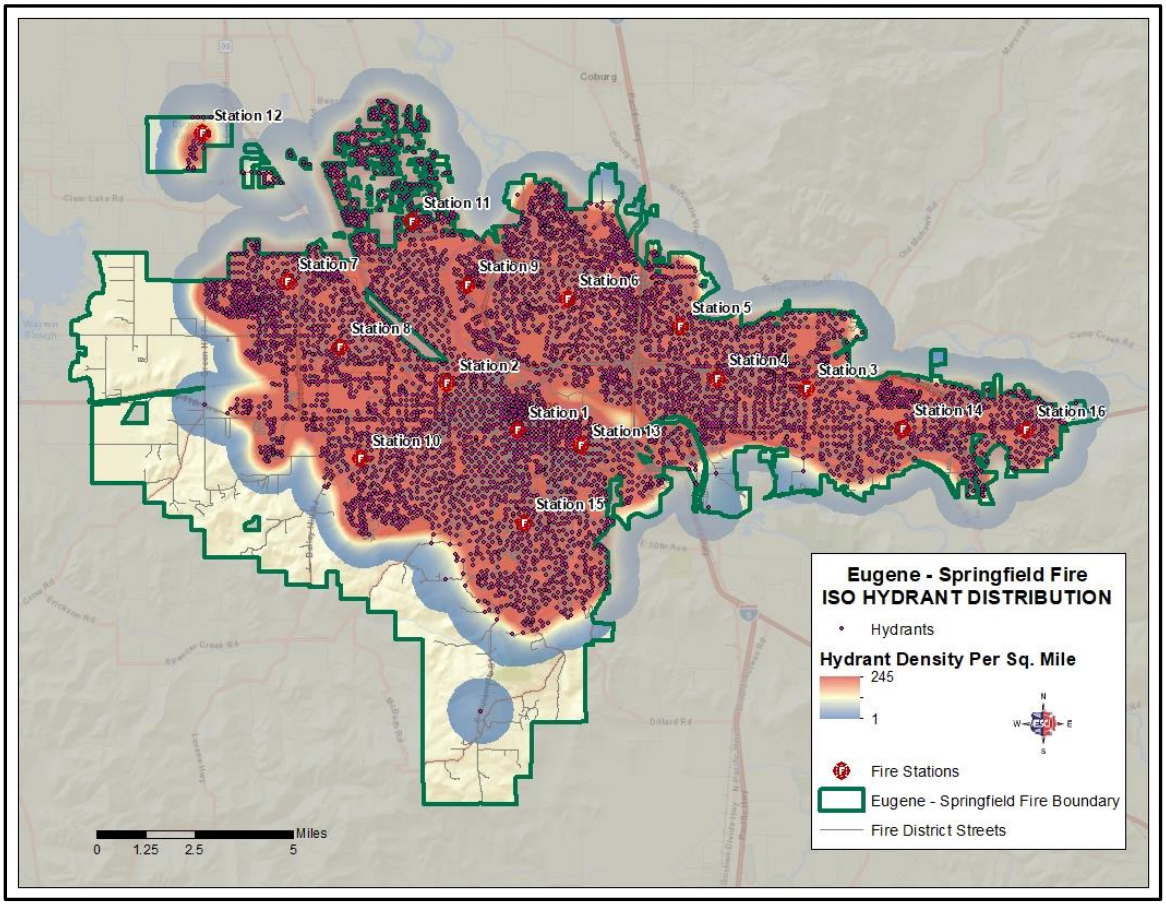
Examples of CIKR locations include, but are not limited to hospitals, congregate-care facilities, schools, airports, government offices, telephone exchanges, data centers, public safety buildings, water and sewage treatment plants, petroleum refineries, ions centers and communications systems, hazardous materials sites, and water/sewage treatment facilities. In some instances, the detailed information of these facilities is kept appropriately confidential for security reasons.

In this section, ESCI discusses other types of infrastructure critical to a community in general terms. It is important that the fire department plan for emergencies at any of these facilities.

Water Distribution

The most obvious concern to the fire department is the water reservoir, water main, and fire hydrant system. Providing enough storage, distribution, and access to this valuable firefighting resource through well-distributed fire hydrants is very important. As shown in Figure 66, hydrants are well-distributed through much of the city except in sparsely populated, mountainous areas. As illustrated in the figure, there are areas in the south and southwest portions of the service area where few to no hydrants are available. This is a vulnerability as growth and development encroach into these areas.

Figure 66: Fire Hydrants



Communications

Emergency communication centers and the associated transmitting and receiving equipment are essential components of emergency response. The Central Lane 911 Center, operated by the Eugene Police Department, provides call receipt and dispatch service to the cities of Eugene and Springfield, and the region. This center receives and interrogates all 911 calls for help, dispatches fire and other emergency responders, and provides incident management support as necessary. There are other communication facilities and equipment that are equally important to the community and government operations. These include; Telephone company central offices, and associated telephone transmission lines, television and radio stations, internet and fiber optic service providers, and cellular communication systems and towers. Several television, radio, and important government radio and microwave transmission towers and systems are located in two main areas: Blanton Heights, approximately two miles south of Eugene, and Coburg Ridge, approximately two miles to the northwest of Eugene.

Figure 67: Communication Infrastructure

Figure 67 illustrates the location of communication antennas and infrastructure throughout the ESF service area.

Based on the number and locations, Figure 68 lists the fire impact on communication systems.

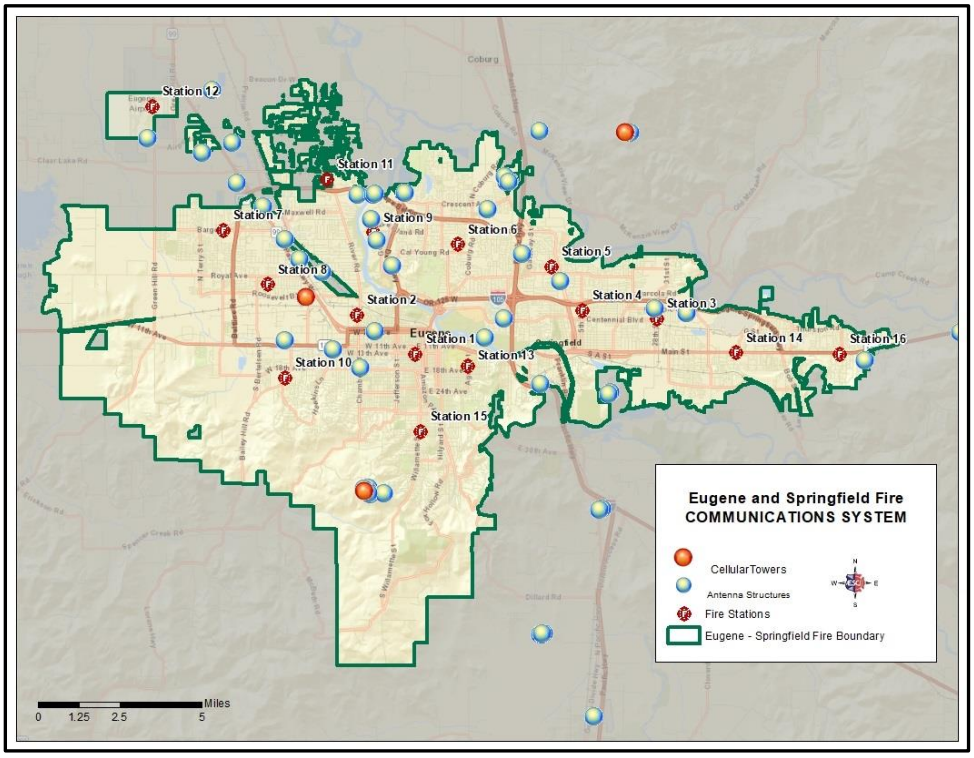


Figure 68: Likely Fire Impact, Communication Facilities

Vulnerability	Impact
Human	Moderate
Physical	High
Social	Catastrophic
Economic	High
Environmental	Low

Government Facilities

Emergency and governmental services include critical first responder and other government-service locations. There is a higher potential risk at these locations due to the interruption of essential services and social impact.

Figure 69: Government Facilities

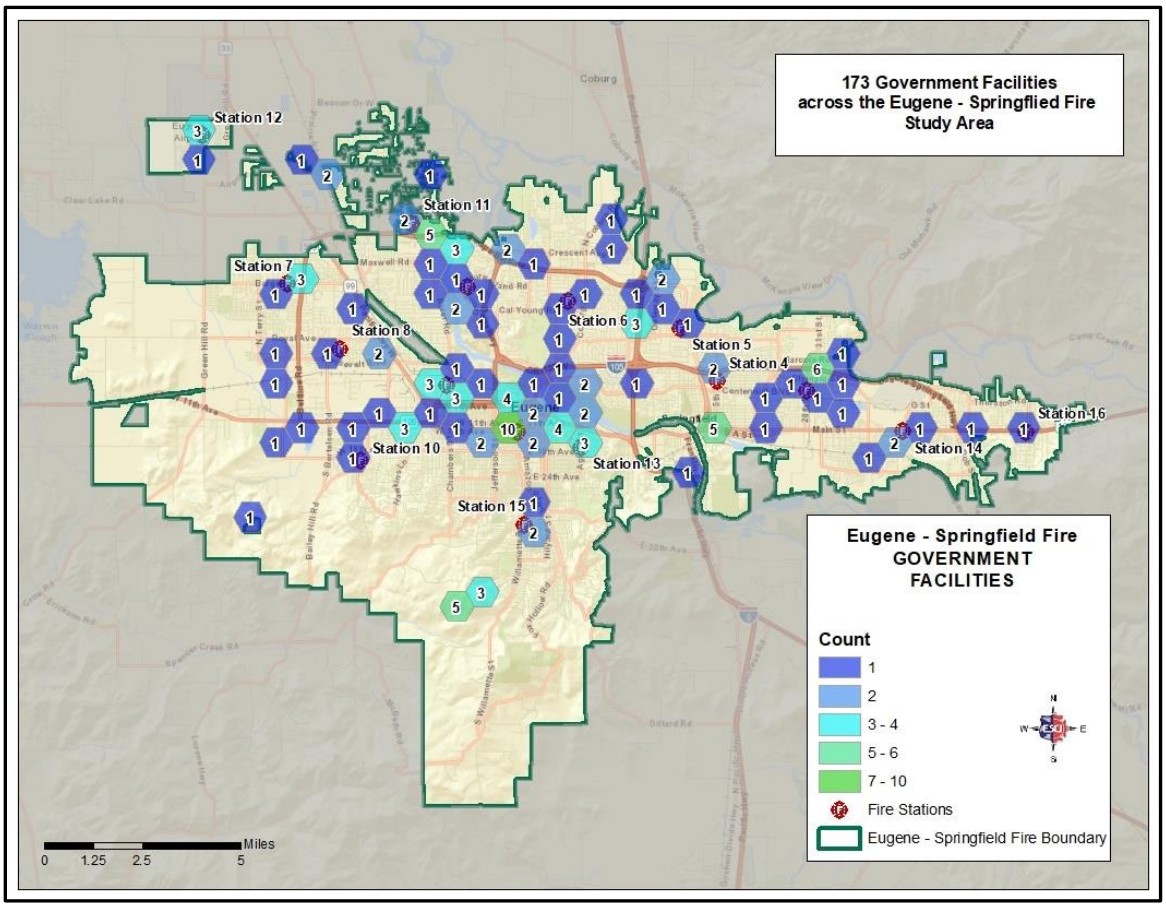


Figure 70: Likely Fire Impact, Government Facilities

Vulnerability	Impact
Human	Low
Physical	High
Social	High
Economic	High
Environmental	Low

Public Assembly Occupancies

Numerous buildings lie within the cities in which large numbers of people gather for entertainment, worship, and other special events. A variety of nightclubs, theaters, and other entertainment venues exist. Also included in this category are recreational, religious, and cultural sites and places where people gather for entertainment, sporting or cultural event, historical purpose, or a similar reason. These occupancies present additional risk due to the large number of people and the economic and social impacts on the community. These sites may also pose greater risks to first responders due to size and configuration. Fire, criminal mischief, and potentially terrorism could cause a major medical emergency requiring significant emergency service resources. The following figure shows the locations of buildings identified as public assembly facilities within the ESF service area.

Figure 71: Public Assembly Facilities

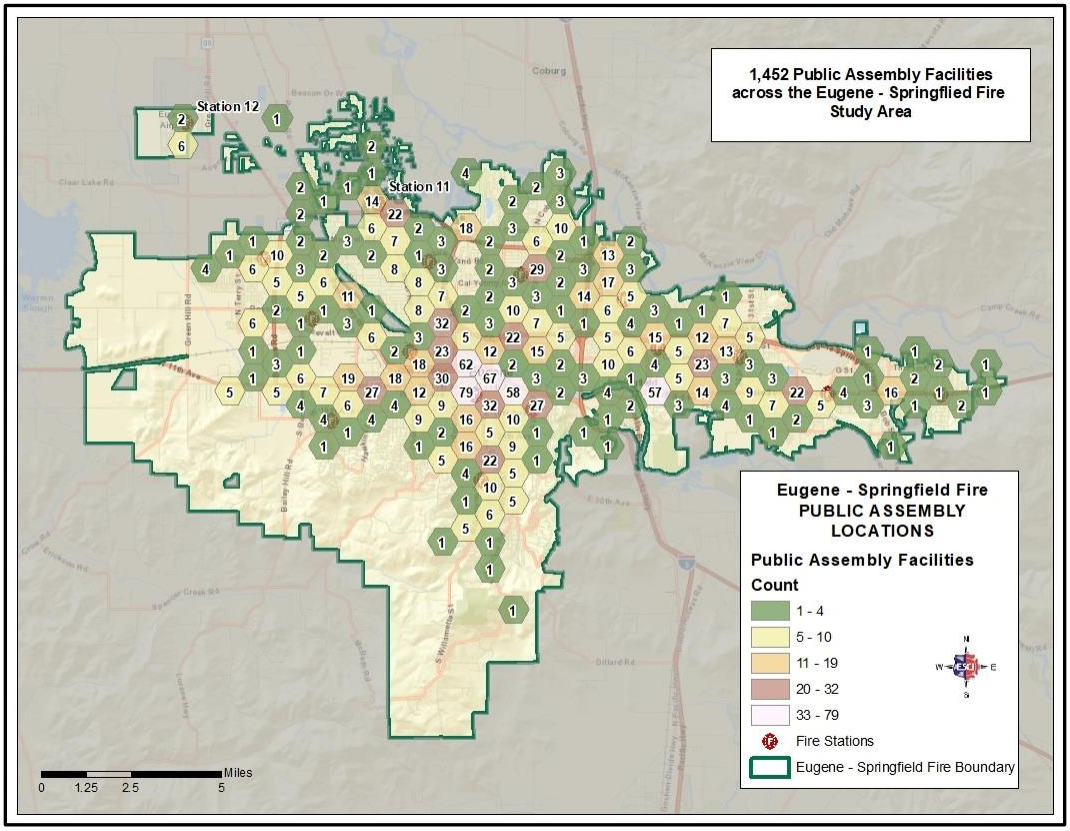


Figure 72: Likely Fire Impact, Assembly Occupancies

Vulnerability	Impact
Human	High
Physical	High
Social	Moderate
Economic	Moderate
Environmental	Low

Educational Occupancies

The Eugene School District has 25 campuses located throughout the ESF service area. There are 14 elementary schools, seven middle schools, and four high schools. The District also support and oversee the operation of five charter schools. The Springfield School District operates eight elementary schools, three middle schools, and one high school. Total enrollment between the two districts is approximately 27,000 students.[29] Several private institutions provide education to the cities' children. The following figure shows the locations of the public and schools and colleges. ESCI has not included all commercial educational facilities.

Figure 73: University, College, and School Locations

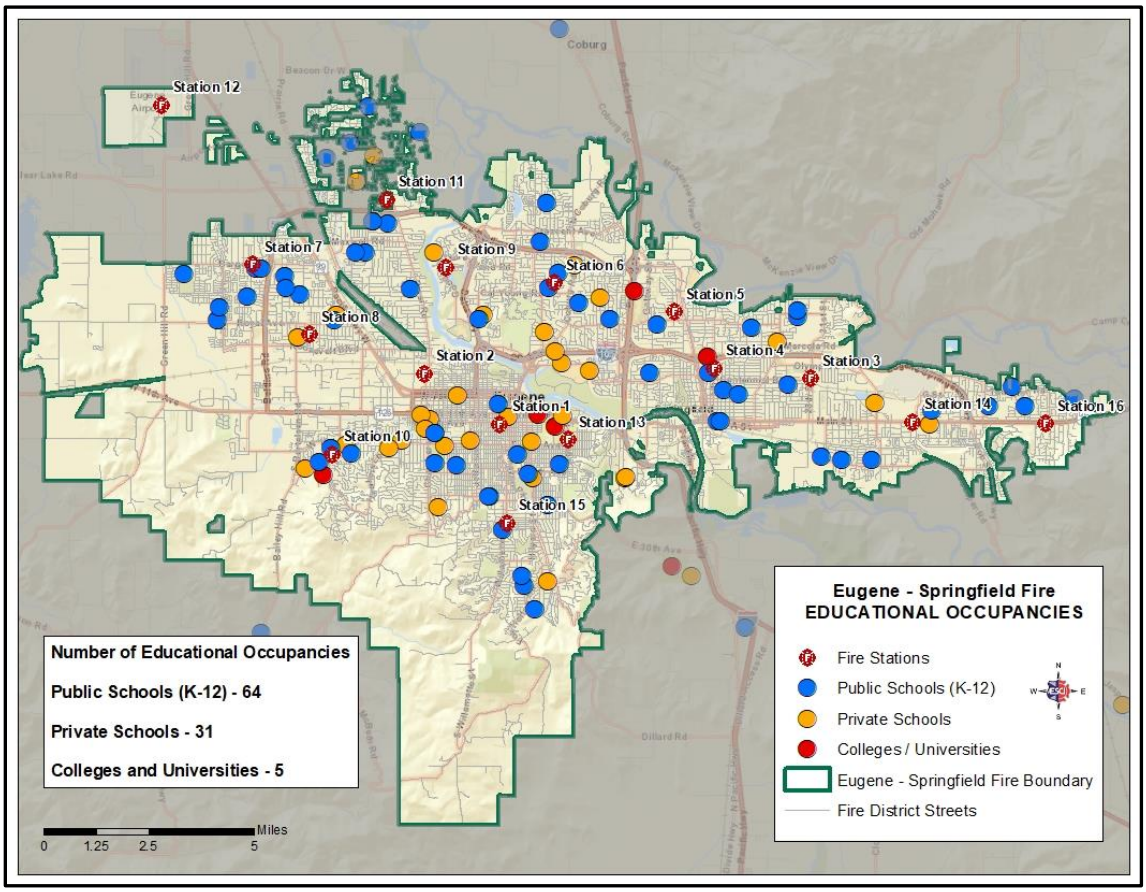


Figure 74: Likely Fire Impact, Educational Occupancies

Vulnerability	Impact
Human	High
Physical	Moderate
Social	High
Economic	Moderate
Environmental	Low

Hospital and Medical Care Facilities

Caring for the sick and injured, and those otherwise needing medical monitoring, is a fundamental service provided in every community. Medical and congregate-care occupancies include facilities such as hospitals, clinics, skilled nursing facilities, and assisted living facilities. Many of the patients in these facilities have special needs and require special assistance in conducting their daily lives. This presents unique and substantial life safety risks, often resulting in substantial reliance on EMS services. Although these facilities are generally required to meet stringent building and fire codes and must have built-in fire suppression systems, even a small fire or another emergency may require the rapid evacuation of patients. The following figure shows the location of hospitals and other medical care facilities, including physician and dental offices, clinics, and medical laboratories and testing facilities.

Figure 75: Medical Care Facilities

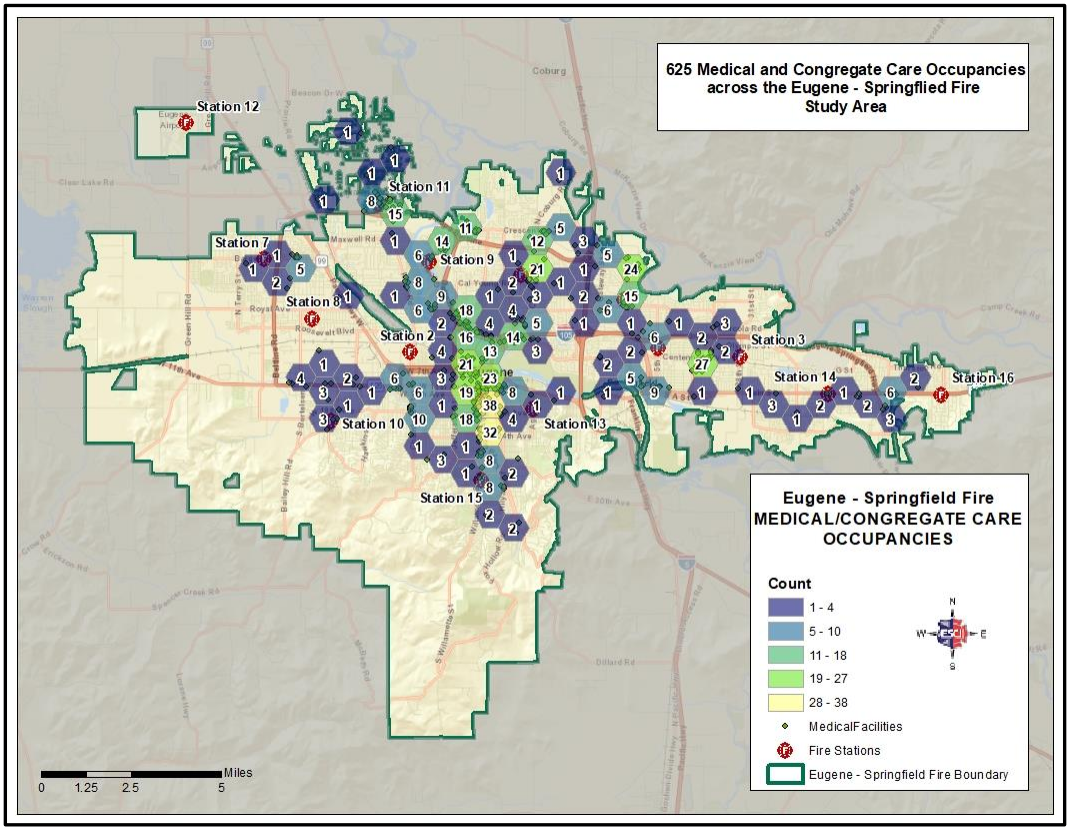


Figure 76: Likely Fire Impact, Health Care Facilities

Vulnerability	Impact
Human	Catastrophic
Physical	High
Social	High
Economic	High
Environmental	Moderate

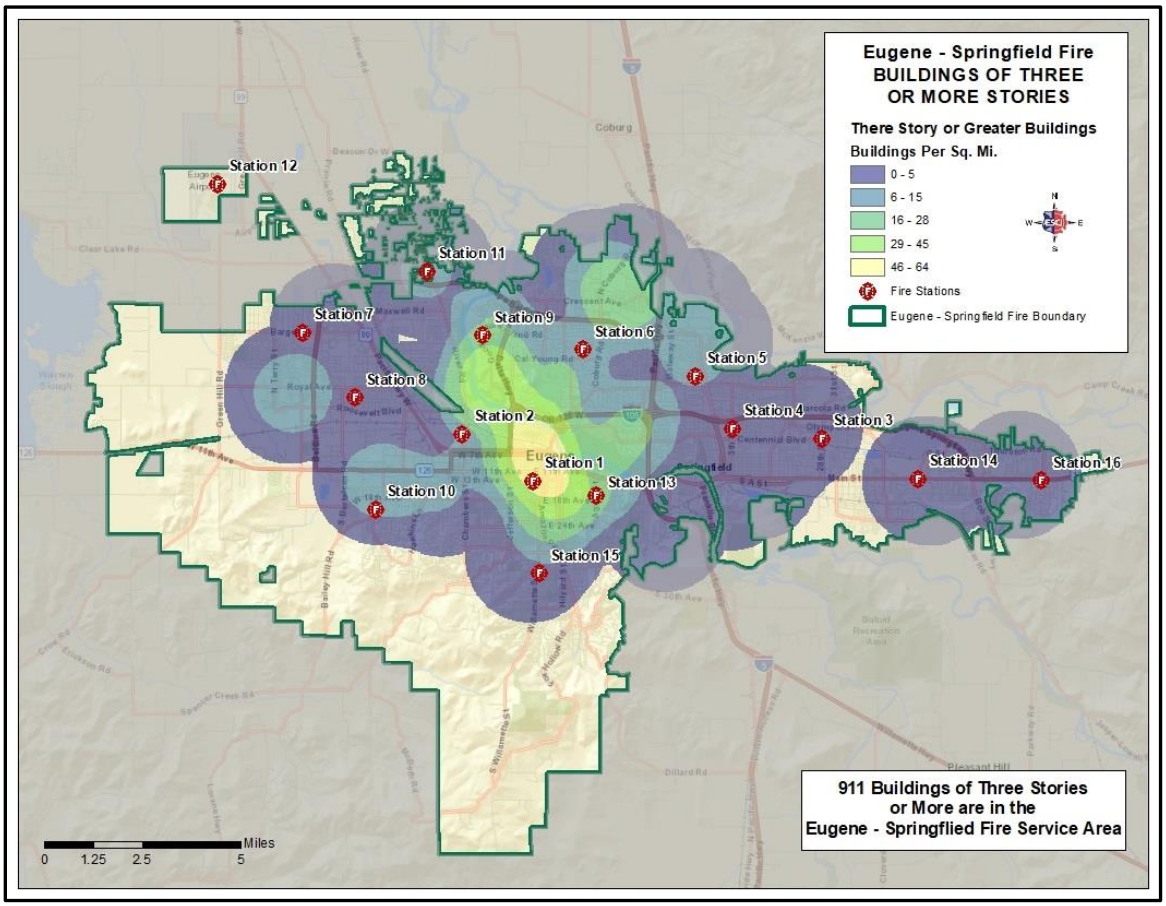
Structural or Operational Risks

Certain buildings, their contents, operational functions, and size present a greater firefighting challenge and require special equipment, operations, and training. Information for this section has been drawn from a recently completed ESF occupancy inventory survey. ESCI noted that the accuracy of the data collected is still under review by ESF. Upon reviewing the data, ESF and ESCI noted the difficulty in differentiating individual occupancies from individual buildings. For example, a strip mall with 10 occupancies may have 10 individual addresses, even though the occupancies are located in one large building.

Occupancies in Buildings Three or More Stories in Height

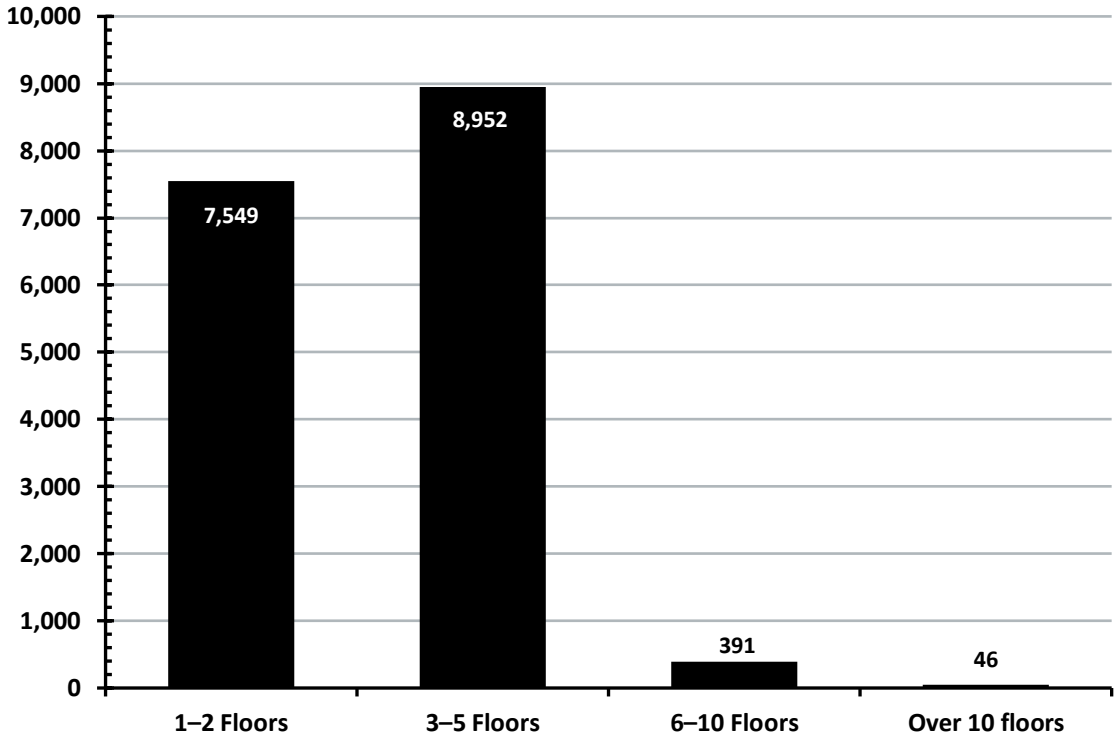
The Insurance Services Office (ISO) rating criteria assesses whether a ladder truck is stationed within 2.5 miles from buildings three or more stories in height. Accessing the upper floors and roof of these buildings typically requires aerial ladder capability, as standard fire service ground ladders may not be sufficient. The following figure shows the locations of occupancies that are located in buildings three or more stories in height.

Figure 77: Occupancies in Buildings, Three or More Stories



The following figure summarizes the number of occupancies in buildings with multiple stories.

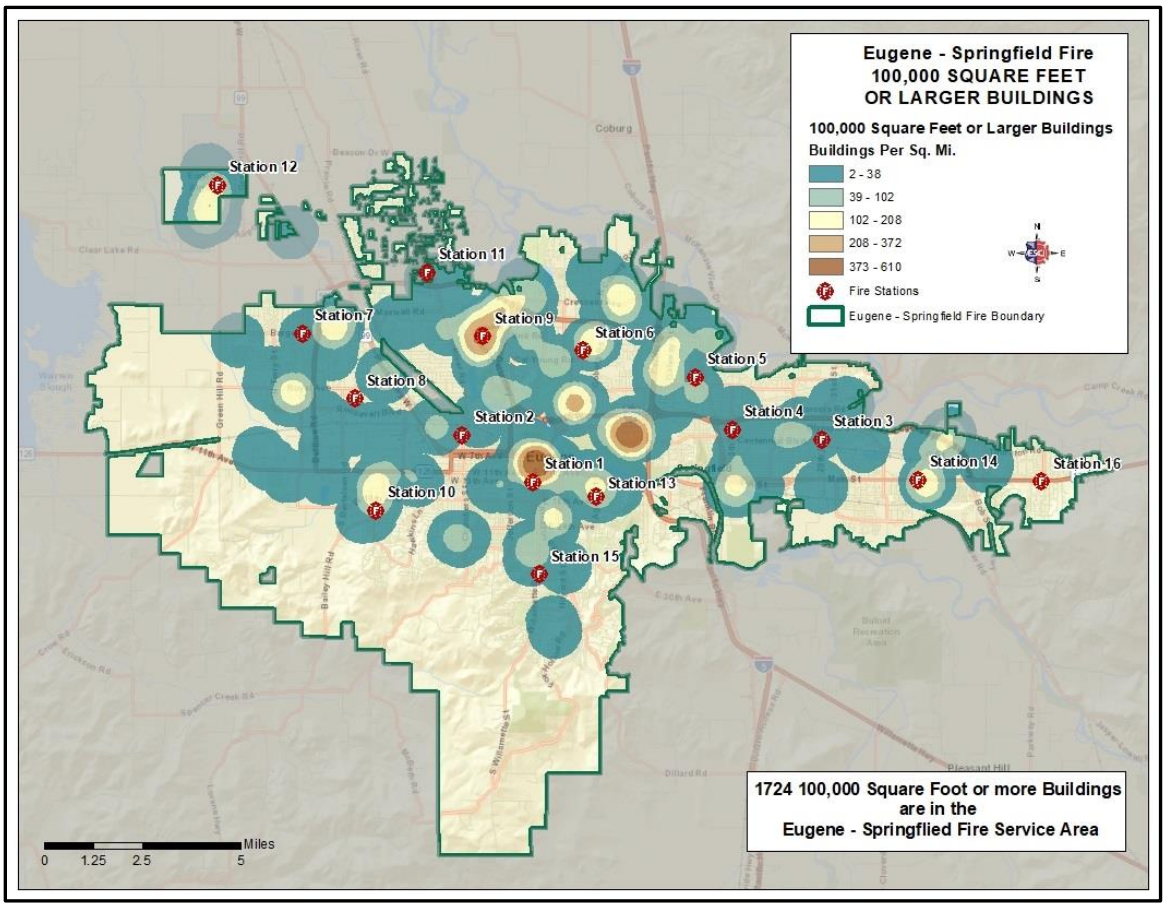
Figure 78: Number of Occupancies in Buildings with Multiple Stories



Occupancies in Large Square Footage Buildings

Large buildings, such as warehouses, factories, malls, and large "box stores" require greater volumes of water for firefighting and more firefighters to advance hose lines long distances into the building. The following figure shows the locations of occupancies in buildings 100,000 square feet and larger.

Figure 79: Occupancies in Buildings, 100,000 Square Feet and Larger



ESCI also quantified the number of occupancies located in buildings with various square footage footprints. The following figure summarizes the number of occupancies in various sized buildings.

Figure 80: Number of Occupancies per Building Square Footage

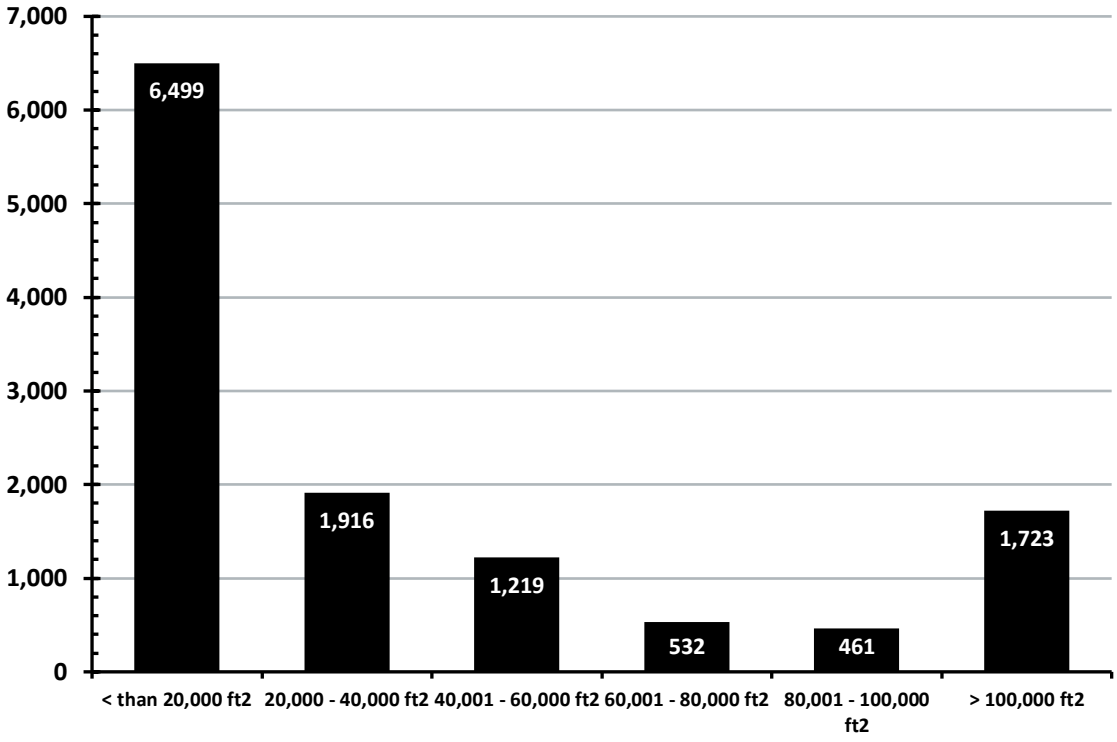


Figure 81: Likely Fire Impact, Large and Multi-Story Buildings

Vulnerability	Impact
Human	High
Physical	High
Social	High
Economic	High
Environmental	Moderate

Multi-Family Dwellings

Multi-family dwellings pose specific risks to civilians and firefighters alike. Densely occupied living spaces have the potential for large losses of life and property. Often, older structures have limited fire department access, dangerous electrical issues, fire code violations, and a lack of automatic sprinkler systems. In addition, many older buildings have large, open attic spaces, or have compromised fire separation walls that can allow a fire to spread throughout these spaces quickly. Multi-family dwelling fires require additional firefighting personnel to perform timely evacuations, search and rescue, and delivery of medical care to those injured by fire or smoke exposure.

Figure 82: Likely Fire Impact, Multi-Family Dwellings

Vulnerability	Impact
Human	High
Physical	High
Social	Moderate
Economic	Moderate
Environmental	Low

COMMUNITY RISK REDUCTION

An emerging trend in the fire service nationally is a concept called Community Risk Reduction (CRR). CRR is an integrated approach to risk management that marries emergency operations and prevention strategies into a more cohesive approach to reducing risks in any community. It includes the fire department partnering with the community, non-profit organizations, and private sector agencies with a nexus to an identified community risk.

Analyzing a community's *actual* data is crucial and can be revealing. Some communities have been surprised by their findings, with the highest actual causes of injuries or death varying widely from previously held perceptions. Working together, fire operations and prevention staff along with other members in the community (as appropriate) can effectively identify actual threats that are supported by the community's data, change damaging outcomes, strengthen their community overall, and reduce the use of emergency resources. Some fire departments have found that by partnering with other entities, they can reduce some calls for service that might be better handled by a more appropriate resource.

> ***"Preparation through education is less costly than learning through tragedy."***
>
> *Max Mayfield, Director, National Hurricane Center*

The CRR process is a creative approach, and successful strategies may include the fire department partnering with other groups or individuals, health districts, sports teams, non-profit organizations, and private sector agencies with a nexus to identified community risks. This can greatly reduce the stress on any single organization or fire department thinking it must handle a CRR effort on its own. In this approach, the larger CRR group similarly works to identify and prioritize community risks, developed mitigation strategies and a CRR plan, which integrates resources across the fire department, partner agencies, and the community. After plan implementation, the results are reviewed to determine progress in minimizing risk impacts, adjustments are made as necessary, and the improved plan is re-implemented. The CRR process approach has had several successes, has gained acceptance, and been adopted by many fire departments across the country.

The most recent ESF ISO analysis and report (2017) identified several areas for improvement, including hiring practices, training, etc. ESCI noted that ISO credit was given to ESF's limited CRR activities helped to push the jurisdiction's classification from a Class 3 to the improved Class 2 designation.

As noted throughout this document, the inherent risks in the ESF service area are not limited to structure fires, nor are they evenly distributed. Pockets of unique and high consequence risks are spread throughout the area. Risk can also be localized by station area. Fire prevention staff have the resources and expertise in overseeing and delivering public education programs. A CRR effort should include the integration of these resources with station officers and community groups to develop and manage a station area-specific CRR plan as a subset of the fire department's overall CRR plan. CRR lends itself well to a volunteer supported effort, led by competent professional leadership. CRR also includes public education for risk reduction.

A prepared and informed community is a safer community.

Given this, ESF should ensure that its fire prevention programs align with Eugene and Springfield's emergency management programs, and leverage the appropriate information into the Lane County Natural Hazard Mitigation Plan. Combining these functions and acquiring additional permanent staff to perform these combined functions fully can result in a more self-reliant, prepared, disaster-resilient community, with an emphasis on educating the residents about prevention, preparedness, and self-help strategies.

Fire Code Enforcement

Plans Review and Code Enforcement

Although a detailed analysis of the Fire Prevention Division activities is outside the scope of this study, ESCI made a few observations worthy of discussion. ESF enforces the 2014 edition of the Oregon Fire Code. All new construction plans for commercial and public buildings are reviewed for required fire and life safety features, including means of egress, occupant loads, and fire protection systems.

Per state law, fire inspections are conducted in all state-licensed facilities, and some permitted hazardous materials and industrial sites. All remaining occupancies are only inspected when a complaint is received, when occupancy use changes with associated construction/remodel activity, or when otherwise selected as a target inspection occupancy group. Several operational permits issued are related to hazardous materials use and storage or other higher hazard uses and activities. However, there are only a limited number of qualified personnel available to inspect these occupancies.

The inspection and enforcement of confidence testing and maintenance of fire protection systems is another concern. According to ESF records, approximately 40% of these systems are not in compliance with Fire Code requirements, and it is unknown if these systems are functional. The Division is notified of many of these deficiencies through auto-notifications of its inspection software. As a result of staffing limitations, there is little follow up in taking enforcement action to force occupancy owners to maintain these systems.

Code Compliance Discussion

During a routine fire inspection, an occupancy is inspected for fire/life safety hazards, general housekeeping, code violations, safe means of egress, and maintenance of installed fire protection systems. Inspection findings should be electronically documented and archived in the Division's RMS. Significant code and fire hazard conditions identified during inspections should be promptly corrected and verified by the Department.

The lack of routine life safety inspections of target hazards in the ESF service area—especially in the large-high density public assembly occupancies—should be of great concern to the cities of Eugene and Springfield. In particular, regular inspection of certain types of public assembly occupancies—dance halls, night clubs, theaters, for example—is critical to ensuring the safety of occupants who are not familiar with the building or are impaired. There are many examples of fires in these occupancy types that resulted in catastrophic loss of life, as noted in the following list.

- Cocoanut Grove nightclub fire: November 28, 1942, 492 fatalities
- Beverly Hills Supper Club fire: May 28, 1977, 165 fatalities
- The Station nightclub fire: February 20, 2003, 100 fatalities
- Ghost Ship warehouse fire: December 2, 2016, 26 fatalities

It should be noted that, except for the Ghost Ship warehouse fire, hundreds of more people suffered serious injuries in each of these fires.

In today's contemporary fire department, consistent and professional safety assessments and follow up of fire code issues in target hazards is a key mission of the organization, and receives significant programmatic emphasis and support.

Potential liability should also be a concern for the cities. Lack of code enforcement and follow up, especially when the fire department knows about a significant issue, potentially exposes the jurisdictions to significant liability. Subsequent to the Station nightclub fire, the National Institute of Standards and Technology (NIST) performed an investigation into the cause and effects of the fire. In its first set of recommendations NIST recommended:[30]

- Adopt a building and fire code covering nightclubs based on one of the national model codes—as a minimum requirement—and update local codes as the national standards are revised;
- Implement aggressive and effective fire inspection and enforcement programs that address all aspects of these codes; and
- Ensure that enough Fire Inspectors and Building Plan Examiners—professionally qualified to a national standard—are on staff to carry out this work.

One potential avenue worth exploring is the expansion of the operational permit program to include additional public assembly target hazard occupancies. Fees collected could generate additional revenue to help offset some or all of the costs of administering the program.

Pre-Incident Planning and Fire Safety Audits

Pre-planning of commercial and public buildings is the process by which operational or Fire Prevention personnel perform an informal walk-through to become familiar with the occupancy. During these site visits, each location is inspected for fire/life safety hazards and code violations, with specific emphasis placed on access, means of egress, fire protection systems, fire hydrant locations, fire department connection locations, etc. In contemporary fire departments, with sufficient resources, this information is collected, cataloged, and archived in a computerized records management system (RMS), which can be quickly accessed in the field. Further, these departments integrate this information into GIS layers that allow for quick visualization in the field, integration with dispatch communication systems, and report generation.

At the time of this study, and with the staffing challenges that face ESF, the department completes pre-incident planning reviews on a limited basis, and its recent ISO credit reflects the lack of documentation for such efforts. ESF recently received an AFG Fire Prevention and Safety grant and completed an effort to update its building inventory noting pertinent information that is important in cases of emergency. Nearly 17,000 occupancies were inventoried and "cataloged." Buildings and developments were inventoried, photographed, and identified with GIS coordinates for quick geographical locating, with important information such as owner contacts, the nearest fire hydrant location, best access or access difficulties, etc., and any hazards were noted. However, at the time of this study, the data is still being "scrubbed" for accuracy. Once all errors have been corrected, the information will be converted to GIS layers and used in the calculation of location risk and for emergency response.

The ESF service area's growth rate is steadily increasing, and the department's ability to keep up with new and existing building safety inspections will continue to be a challenge. ESF is also in the process of evaluating its current RMS for upgrades or replacement during this next year. One of the goals of this update is to ensure operations crews have quick access to important pre-fire plan information of the various occupancies in the ESF service area, along with the ability to update this information while still in the field.

Community Outreach and Education

ESF has a number of community outreach efforts for public education in association with the Emergency Management offices of both cities of Eugene and Springfield in addition to Lane County. They include the distribution of safety-related topics accessible on various city and county websites, public event distribution points, public service announcements, partner outreach projects (e.g., Red Cross smoke alarm installation project), elementary school and college campus visits, fire station tours, and many opportunities for collaborative participation in safe community activities. ESF is also enhancing its social media presence in advance of the major special events they will be hosting in the coming two years. ESF has very limited personnel assigned specifically for public education efforts, and the jurisdiction does their best with the limited resources currently available.

COMMUNITY GROWTH & RISK

Future Development

The cities of Eugene and Springfield have adopted Comprehensive Plans that established goals and objectives related to the expansion of city boundaries, population growth and development, desired community characteristics, and transit needs and infrastructure. These plans were created, taking into consideration the goals and objectives of the Eugene-Springfield Metropolitan Area General Plan. This plan identified the following objectives pertinent to this study:[31]

- Continue to minimize urban scatteration and sprawl by encouraging compact growth and sequential development.
- Ensure that land supply is kept in proper relationship to land use needs.
- Conserve those lands needed to accommodate expected urban growth efficiently.
- Encourage the development of suitable vacant, underdeveloped, and re-developable land where services are available, thus capitalizing on public expenditures already made for these services.

The cities will continue to "infill" consistent with this plan and their own internal planning efforts. The result of this approach should continue to maximize the use of existing city services, including ESF emergency response resources. The current Eugene Urban Growth Boundary (UGB) has not been expanded for housing. However, a slight expansion of the UGB had been recommended previously for approximately 950 acres. Almost all of this expansion was in the Clear Lake area for business and school campuses. An additional 50 acres of expansion was planned for parks use in the Santa Clara area.[32]

The City of Springfield's Comprehensive Plan also includes an expansion of the city's UGB. Additional land was added to its UGB in 2016, including 216 acres in the North Gateway area, 508 acres in the Mill Race area, and 72 acres of dedicated Willamalane Park land in the southeast UGB area.

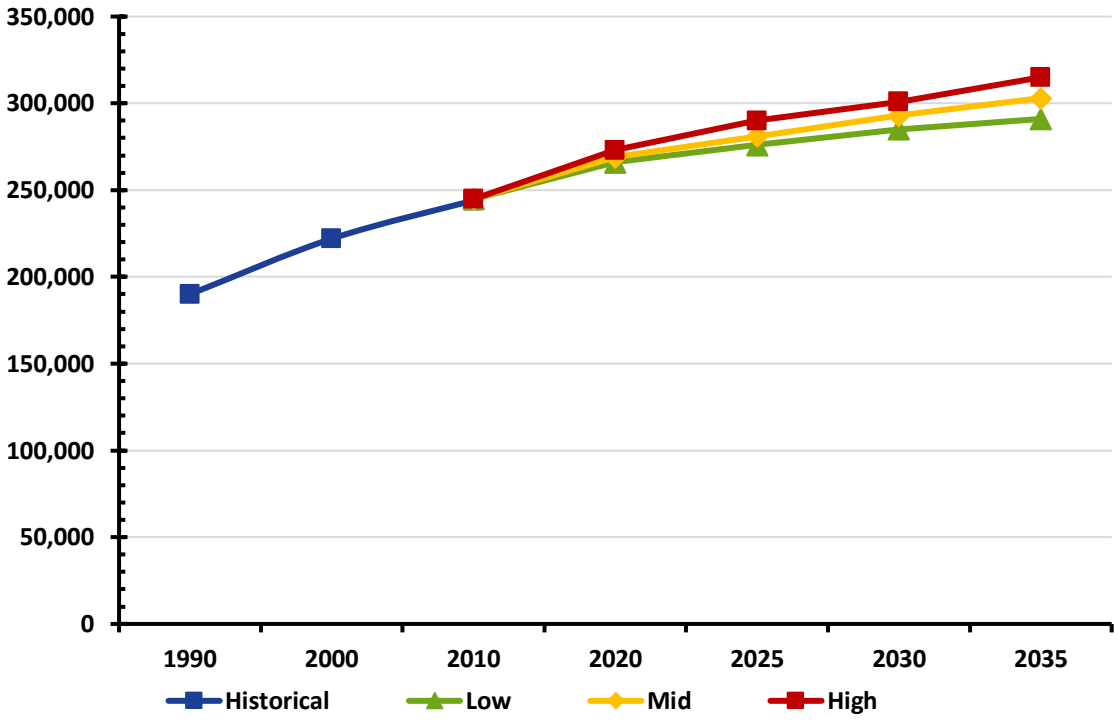
It is important to note that the UGB expansions in both cities were for business and public uses, not housing. Springfield has a large UGB footprint, primarily to the south and east of the current city limits.

ESF's service area already encompasses almost all of the UGB land in both cities. As buildout occurs in these areas, impact on emergency services will likely be incremental, and depending on the type of build-out and use in these areas, life safety code enforcement requirements may increase as well.

Projected Population Growth

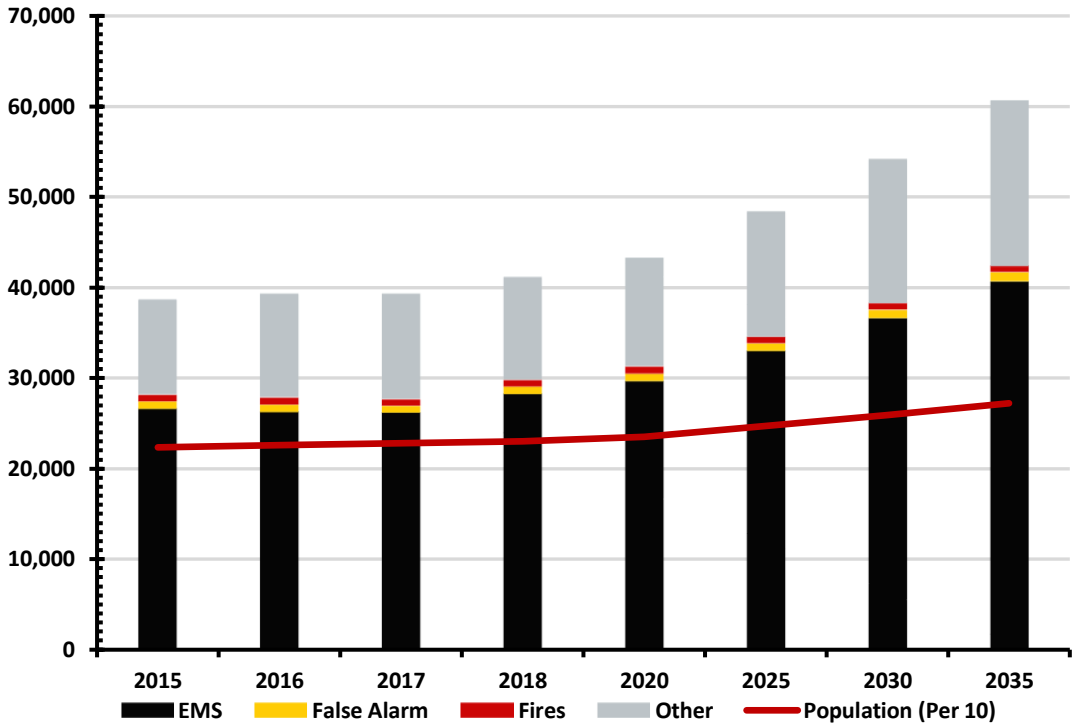
It is widely understood that there is a direct correlation between population density and the number of emergency incidents experienced in the community. In other words, as the population increases, so does the number of emergency incidents, especially EMS incidents. Except for the early to mid-1980s, the populations of Eugene and Springfield have grown steadily since 1975, expanding by 50% by 2010.[33] More recently, the populations of Eugene and Springfield have experienced similar annual population increases of 1% per year. The following figure shows population projections through 2035, which includes aggressive and conservative projections.

Figure 83: Eugene Springfield UGA Population Projections[33]



ESCI also overlaid the Eugene and Springfield population projections through 2035, as calculated by Portland State University's Population Research Center, as shown in the following figure. ESCI applied a per capita incident rate derived from historical service demand to the projected population in the service area to forecast future service demand. Note that the service demand increases vary depending on incident type. For example, based on historical incident information, EMS incidents are projected to increase by slightly over 2% per year. Other incident types were projected to increase by 3% per year. False fire alarms were projected to increase by only 1% per year, and the number of fire incidents was projected to stay about the same from year to year.

Figure 84: Incident Projections, 2015–2035



It must also be noted that these projections are based on the current service area and built environment. ESCI did not take into account annexations, large scale development, and other agreements to provide emergency response services to other adjacent jurisdictions in the incident projections.

The age demographic in a community is another important aspect to consider when anticipating demand for emergency services, especially EMS responses. According to the State of Oregon Office of Economic Analysis, the elderly population over age 75 in Lane County is projected to increase by 4% over the next 10 years.[34] This will undoubtedly have an impact on EMS service delivery in the ESF service area.

The Unhoused Issue

People living without homes is another changing demographic in the Eugene and Springfield area. The cities have experienced a significant "uptick" in the number of unhoused people, with their numbers steadily increasing since 2016, including a 32% increase between 2018 and 2019.[35] As a result, in July 2019, the Eugene City Council approved $1.9 million to provide staff to develop and oversee programs to address the issue, build a large temporary living structure for up to 75 people, and provide landlords financial incentives to create affordable housing.

Interviews with ESF staff reveal that the significant increase in this population has resulted in increased emergency and non-emergency responses, along with introducing unique fire and life-safety code issues related to temporary housing, ad-hoc aggregate living situations, and illegal occupying of vacant structures. This has resulted in numerous fire and life-safety code violations. ESCI understands that efforts to gain compliance have been somewhat stymied by conflicting interpretations of related codes, political issues, and overall lack of agreement on the best approaches to address this significant social issue.

SUMMARY & RECOMMENDATIONS

Eugene Springfield Fire retained ESCI in March 2019 to conduct an All-Hazards Community Risk Assessment, with a focus on fire prevention mitigation efforts and planning for future large-scale sporting events. Throughout our research, we were struck by the high level of engagement, professionalism, and adaptability of this growing and evolving organization. We were also very impressed with the amount of detailed disaster planning and preparedness efforts already in place, especially in the realm of natural hazards mitigation planning.

Specific to planning for the upcoming sporting events, ESCI believes the long history of inter-agency public safety and security planning and execution in hosting large sports and entertainment events will be easily adaptable to the 2021 World Track & Field Championship. While ESF has seen increases in EMS service demand during large entertainment events, their previous experience shows that large sporting events typically do not result in a large increase in service demand. This is most likely the result of the healthy demographic of attendees, and lack of alcohol sales during these events. The University of Oregon's 2018 decision to expand the sale of alcohol at home football games at Autzen Stadium has not adversely impacted EMS response demand.

Even though significant resources are in place to address risk and hazards in the Eugene and Springfield communities, and in addition to the recommendation to implement a CRR program as previously noted, ESCI believes more can be done to better position the organization and community for addressing these risks and offers the following additional observations and recommendations.

Continue a Targeted Wildfire Prevention/Mitigation Program

Given the significant wildfire risk in portions of the service area, ESF should continually dedicate efforts to educating those living and working in the wildland-urban interface neighborhoods about their wildfire risk, steps they can take to better prepare, and WUI fuels reduction. Lane County offers the Firewise program to residents living in unincorporated rural Lane County areas; however, residents within the Eugene and Springfield city limits do not qualify for this program, which includes access to wildfire mitigation grant funds.

ESCI understands that the Eugene City Council recently authorized funding for a joint youth work force-wildfire risk reduction program, intending to create "defensible space" around homes in the WUI and educate these residents of the need to make their properties more resistant to the impacts of wildfires.

Increase Fire Prevention Staff and Inspections

During the study, ESCI noted that the Fire Prevention Division was managed by an Acting Fire Marshal, whose previous position was not backfilled. This leaves only three Deputy Fire Marshals to handle complaints, public education, the Juvenile Firesetters program, and operational permit and target hazard inspections. Three other DFMs primarily perform plan reviews, new construction related inspections, and fire protection system acceptance testing. All DFMs conduct fire investigations as required.

As previously noted, due to the lack of resources to support consistent fire code compliance efforts, and the lack of consistent periodic inspections of target hazard occupancies, the department should consider increasing Fire Prevention Division staffing to ensure life safety code compliance is maintained in all relevant occupancies in the cities of Eugene and Springfield. This is critical in meeting ESF's safety objectives, and the Oregon State Fire Marshal's partial exemption status allowance.

Improve Radio/Data Communications System Planning and Interoperability

As noted previously in this study, ESF has been aggressively updating its field data and 900 MHz radio system infrastructure to improve radio coverage and capacity. However, these upgrades and improvements are only being implemented within the ESF service area, and apparently not being coordinated with other adjacent fire and public safety agencies. This is not necessarily the fault of ESF, as they have a pressing need to ensure their emergency crews can clearly communicate on incidents. Instead, it highlights the need for better coordination and integration of the various emergency responder radio systems that integrate with the Central Lane 911 Center.

ESF and adjacent fire and EMS response agencies would likely benefit from the creation of an interagency communications/governance organization, similar to the local law enforcement's Lane Regional Interoperability Group. Improving coordination and management of the various radio and data systems used by local fire and EMS agencies may improve radio system capacity, interoperability, and efficiencies, all of which are critical in effectively responding to large-scale and disaster situations.

Standardize Administrative Policies, Procedures, and Processes

The department exercises different policies and procedures, depending on an employee's "home employer." This perpetuates inefficiencies in administering many of the employee support functions, such as Human Resources support, payroll, benefits coordination, etc. During a disaster event, this could create an unnecessary and unwieldy burden on administrative staff and managers.

As previously recommended in an ESCI study, the merger of the two fire departments would eliminate this incongruency, and likely streamline administrative support tasks and communications, and may eliminate barriers that prevent administrative cross-training that may be critical in a disaster situation. Short of a full merger—and understanding there may be bargaining unit implications—ESF should compare these divergent policies and procedures, and combine or adopt single policies and procedures where possible for all employees, regardless of employer affiliation.

Increase Collaboration and Coordination Between Emergency Management & ESF

During the site visit, some of the information shared revealed apparent barriers to effective communication and coordination between the ESF Operations Division, Fire Prevention Division, and Eugene and Springfield's Emergency Management Offices. While it is beyond the scope of this study to identify the specific reasons for this, ESCI feels that efforts should be undertaken to improve coordination of emergency management planning, education, and preparation activities between ESF and both cities, with a focus on integrating EM and ESF public education and planning activities into their respective operations.

Address the Unhoused Issue

Those living without housing is very visible in the community and has resulted in the allocation of significant funds to address the problem. However, the impact of this growing problem on ESF operations and life-safety remains somewhat nebulous. ESF should take steps to collect specific data related to this issue, including identifying unhoused EMS patients, and fire and other life-safety issues created by persons found in their circumstances to determine whether any changes should be made to ESF's procedures in alignment with the service area's overall goals. Further, ESF should participate in relevant community planning efforts to address this issue. The purpose of this is two-fold: (1) To ensure the unique life-safety risks and challenges related to housing are addressed upfront in the planning process, and; (2) To ensure key planning stakeholders understand the relevant ESF services that are provided.

APPENDIX A: HAZARD VULNERABILTY MATRICES

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL								
STRUCTURE FIRES-Eugene-Springfield								
EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
Moderate Risk Urban	2	2	2	2	1	1	2	**21%**
High Risk Urban	1	3	3	3	2	2	2	**16%**
Moderate Risk Suburban	2	2	2	2	1	1	2	**21%**
High Risk Suburban	1	3	2	2	2	2	2	**14%**
Moderate Risk Rural	2	1	2	2	1	1	1	**17%**
High Risk Rural	1	2	2	2	2	2	2	**13%**
Low Risk Rural	2	1	1	1	1	1	1	**13%**
AVERAGE SCORE	1.57	2.00	2.00	2.00	1.43	1.43	1.71	**17%**

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL								
NON-STRUCTURE FIRES-Eugene-Springfield								
EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
High Risk Urban	2	3	3	3	2	2	2	**31%**
Moderate Risk Urban	2	2	2	2	1	1	2	**21%**
Low Risk Urban	2	1	1	1	1	1	1	**13%**
Urban/Wildland Interface	2	3	2	2	3	2	2	**29%**
AVERAGE SCORE	2.00	2.25	2.00	2.00	1.75	1.50	1.75	**23%**

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL								
EMS-MEDICAL ASSISTS-Eugene-Springfield								
EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
High Risk	1	3	1	1	0	0	2	**7%**
Moderate Risk	3	2	1	1	3	3	2	**38%**
Low Risk	4	1	1	1	4	4	2	**54%**
AVERAGE SCORE	2.67	2.00	1.00	1.00	2.33	2.33	2.00	**30%**

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL								
RESCUE-Eugene-Springfield								
EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
Rescue - MVA	3	1	1	1	2	2	2	**28%**
Rescue - Structural Collapse	1	3	4	2	2	2	2	**16%**
Rescue - Trench	1	2	2	1	2	2	2	**11%**
Rescue - Low/High Angle	1	2	1	1	2	2	2	**10%**
Rescue - Confined Space	1	2	1	1	2	2	2	**10%**
Rescue - Swiftwater	4	3	1	1	0	0	2	**29%**
Rescue - Stillwater	2	2	1	1	2	2	2	**21%**
Rescue - Ice	1	2	1	1	2	2	2	**10%**
Rescue - Other	2	3	1	1	2	2	2	**23%**
AVERAGE SCORE	1.78	2.22	1.44	1.11	1.78	1.78	2.00	**19%**

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL

HAZARDOUS MATERIALS-Eugene-Springfield

EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
High Risk Hazmat - Urban	3	3	4	3	2	2	3	**53%**
Moderate Risk Hazmat - Urban	3	2	2	2	2	2	3	**41%**
Low Risk Hazmat - Urban	2	1	2	1	1	2	3	**21%**
High Risk Hazmat - Suburban	3	2	2	2	2	2	3	**41%**
Moderate Risk Hazmat - Suburban	3	2	2	2	1	2	3	**38%**
Low Risk Hazmat - Suburban	2	1	2	1	1	2	3	**21%**
High Risk Hazmat - Rural	2	2	2	2	2	2	3	**27%**
Moderate Risk Hazmat - Rural	2	1	1	1	1	2	3	**19%**
Low Risk Hazmat - Rural	2	1	1	1	1	2	3	**19%**
AVERAGE SCORE	2.44	1.67	2.00	1.67	1.44	2.00	3.00	30%

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL

NATURALLY OCCURRING EVENTS-Eugene-Springfield

EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
Tornado	0	0	0	0	2	2	2	**0%**
Severe Thunderstorm	1	1	1	1	2	2	2	**9%**
Snow Fall	1	1	1	1	4	4	4	**16%**
Blizzard	1	1	1	1	3	3	3	**13%**
Ice Storm	2	2	3	3	3	3	3	**35%**
Earthquake	3	4	4	4	2	3	3	**63%**
Tidal Wave	0	1	1	1	2	2	2	**0%**
Temperature Extremes	2	2	2	2	2	2	2	**25%**
Drought	2	2	2	2	2	2	2	**25%**
Flood, External	3	2	2	2	2	2	2	**38%**
Wild Fire	4	3	2	2	3	1	1	**50%**
Landslide	1	2	3	3	3	3	3	**18%**
Dam Inundation	1	4	4	4	3	3	4	**23%**
Volcano	1	1	2	1	2	2	2	**10%**
Epidemic	2	2	1	2	2	2	2	**23%**
AVERAGE SCORE	1.60	1.87	1.93	1.93	2.47	2.40	2.47	**22%**

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL								
TECHNOLOGIC EVENTS-Eugene-Springfield								
EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
Electrical Failure	2	2	1	2	1	2	2	**21%**
Generator Failure	1	3	1	3	2	2	2	**14%**
Transportation Failure	2	4	2	4	3	3	3	**40%**
Fuel Shortage	2	4	2	4	3	3	3	**40%**
Natural Gas Failure	2	4	2	4	3	3	3	**40%**
Water Failure	2	4	2	4	3	3	3	**40%**
Sewer Failure	2	4	3	4	3	3	3	**42%**
Steam Failure	1	1	1	1	2	2	2	**9%**
Fire Alarm Failure	1	3	3	3	2	2	2	**16%**
Communications Failure	2	4	2	4	3	3	3	**40%**
Medical Gas Failure	1	3	1	3	2	2	2	**14%**
Medical Vacuum Failure	1	3	1	3	2	2	2	**14%**
HVAC Failure	2	1	2	2	2	2	2	**23%**
Information Systems Failure	2	4	2	4	3	3	3	**40%**
Fire, Internal	3	2	3	3	2	1	1	**38%**
Flood, Internal	2	1	1	1	1	2	2	**17%**
Hazmat Exposure, Internal	2	2	2	2	2	2	3	**27%**
Supply Shortage	2	4	1	4	3	3	3	**38%**
Structural Damage	1	1	3	3	2	2	2	**14%**
AVERAGE SCORE	4.71	2.14	1.84	3.05	2.32	2.37	2.42	27%

ESCI HAZARD AND VULNERABILITY ASSESSMENT TOOL

HUMAN RELATED EVENTS-Eugene-Springfield

EVENT	PROBABILITY	SEVERITY = IMPACT - MITIGATION)						RISK
		COMMUNITY IMPACT			MITIGATION CAPACITY			
	Likelihood this will occur	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	*Relative threat**
SCORE	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Very High	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = N/A 1= Low 2 = Moderate 3 = High 4 = Catastrophic	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	0 = Very High 1= High 2 = Moderate 3 = Low 4 = None	*0 - 100%*
Mass Casualty Incident (trauma)	2	3	1	1	1	1	2	**19%**
Mass Casualty Incident (medical/infectious)	2	3	2	2	2	2	2	**27%**
Terrorism	2	4	4	4	2	2	2	**38%**
VIP Situation	2	4	1	4	2	2	2	**31%**
Infant Abduction	1	4	1	2	2	2	2	**14%**
Hostage Situation	1	3	1	1	2	2	2	**11%**
Civil Disturbance	2	3	3	3	1	1	1	**25%**
Labor Action	1	3	1	1	2	2	2	**11%**
Forensic Admission	1	1	1	1	2	2	2	**9%**
Bomb Threat	2	1	1	1	2	2	2	**19%**
AVERAGE SCORE	**1.60**	**2.90**	**1.60**	**2.00**	**1.80**	**1.80**	**1.90**	**20%**

APPENDIX B: TABLE OF FIGURES

APPENDIX C: REFERENCES

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