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**Poverty Rates of Communities at High Risk for Wildfire in Eastern
Washington State**

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Poverty Rates of Communities at High Risk for
Wildfire in Eastern Washington State

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EMPA 396

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Abstract

Wildfires are causing increasing property damage to communities, as well as loss of life across the United States. There are actions residents of communities at risk from wildfires can take to protect their homes and personal safety. These actions include landscaping with fire resistant plants, replacing home roofing and siding material, and improvements to road access and fire protection capabilities. Such measures can be expensive and low income residents may not have the resources undertake these actions. This study will investigate poverty rates and median household incomes as key indicators of community capacity to reduce wildfire risks.

This paper examines the relationship between poverty rates and wildfire risk in communities at high risk for wildfire in Eastern Washington. Poverty levels of residents of communities identified as high wildfire risk through the Washington Department of Natural Resources Wildland/Urban Interface Risk Assessment will be estimated using 2000 Census data. These areas will be compared to other areas of their counties and the Eastern Washington region to determine whether residents of high wildfire risk communities experience higher poverty rates.

Introduction

Most forests in North America evolved with fire. Whether started by lightning, Native Americans burning hunting grounds, or European settlers clearing land, fire has shaped the forests and how people live in them (Pyne, 1984). In America, the way people view fire evolved in the twentieth century from seeing fire as a tool to be used to clear land and a force of nature to an enemy to be suppressed at all costs (Davis, 2001).

Today, fire in forests is increasingly viewed as a natural part of the environment, something that must be lived with and even encouraged in the right places. At the same time that fire is becoming viewed as a positive part of the environment, more people are choosing to live in areas where fire is a natural and sometimes a frequent part of the ecosystem. The preference to live in rural areas and the increasing cost of housing in metropolitan areas leads to the prediction that population growth in rural areas will soon exceed urban areas (Keeley, Fotheringham, and Morais. 1999).

The term wildland-urban interface (WUI), defined as “the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels” (NWCG, 1996) is used to describe the area where fire has the greatest potential to damage property and human life. Nationally, the wildland-urban interface is estimated to cover ten percent of the land area of the United States (Haight, 2004). The Center for Watershed and Community Health (CWCH) (2001) estimates that in the Western United States 15 million homes in wildland-urban interface are at risk from wildfire and that 3 to 5 million of those homes are inhabited by people living in poverty.

While fire is a natural part of forest ecosystems, understanding the demographics, including poverty levels, of residents of high wildfire hazard areas is important for the

development of rational public policies. If people living in areas prone to wildfires lack financial resources, they may not have the capacity to take actions to reduce the flammable vegetation around their homes or to make improvements in their homes to reduce wildfire hazards (CWCH, 2001). They may also be unable to pay additional taxes to support improvements in emergency services needed to provide adequate fire protection. However, if residents of high fire hazard areas do have the financial resources to reduce their risk from wildfires to their property, then public resources may be better spent on other public needs.

Several programs have been developed to educate residents of high wildfire hazard areas of the risks and their personal responsibility to take actions to protect their homes, property and families from wildfires. The Firewise program seeks to educate residents of fire-prone areas about how to live with wildland fire. Firewise was developed by the National Wildfire Coordinating Group (NWCG, 1996), a consortium of wildland fire agencies that includes the USDA-Forest Service, the Department of Interior, the National Association of State Foresters, the U.S. Fire Administration and the National Fire Protection Association. FireFree is a public education program developed by Safeco Insurance Company that has been used since 1997 in the state of Oregon “to address the high risk of wildfire to homes and property and to increase resident participation in wildfire defense” (Marshall, 2004). Living With Fire is a program developed by the United States Department of Interior Bureau of Land Management (BLM) targeted at homeowners in the interior west. Living With Fire shows residents of high hazard areas how to create a “defensible space” around homes to reduce the likelihood that homes will burn in wildfires (Pacific Northwest Wildfire Coordinating Group, No Date). Another program is FireSafe Spokane. The mission of FireSafe is “to create a safer environment

through implementing fuel modification and defensible space, which will reduce losses and costs from wildfires" (FireSafe Spokane, 2004). International wildland urban interface efforts include Operation Firestop in South Africa and FireSmart in Alberta, Canada.

Each of these programs shares in common an apparent focus on a middle to upper-income demographic. Their educational materials use examples and photos of expensive homes in new subdivisions. Much emphasis is placed on landscaping and potentially expensive home improvements as techniques to mitigate wildfire hazards to homes.

This research paper will analyze the household poverty levels of communities at high risk for wildfire in Eastern Washington State. Policy recommendations for mitigating hazards that are tied to local demographic characteristics will be provided. Tying wildfire hazard mitigation strategies to poverty levels is important because there are limited funds for hazard mitigation. Assisting residents of wildfire hazard areas is not the only wildfire mitigation need or strategy. Other needs include reducing hazardous fuels on public lands, and improving the capabilities of local fire protection agencies to respond to wildfires.

Literature Review

Wildfire as a Public Policy Issue

Wildfire as a public policy issue in the United States goes back over one hundred years to the establishment of the United States Forest Service in 1898 (Davis 2001; Pyne, 1984). The early conservation movement was split on the need to suppress forest fires.

Some experts believed that fire played a natural role in maintaining natural forest conditions (Coen, 2003). Others predicted America's increasing reliance on wood products would lead to a timber famine unless actions were taken, including aggressive fire suppression, to renew and protect the dwindling forest resource (MacLeery, 1995). Following several devastating wildfires in the early twentieth century, including the 1902 Yacolt Burn in Southwest Washington (one million acres burned, 36 lives lost), and the 1910 Idaho Fire (five million acres burned, 79 lives lost), the debate quickly ended in favor of suppression of all forest fires (Davis 2001; Pyne, 1984). Fire became an enemy that could only be fought with an increasingly large army of foresters and firefighters. This led to a policy goal of extinguishing all wildfires by 10:00 a.m. of the day after the fire was discovered. Pyne describes the evolution of national fire policy from one of exclusion, eliminating fire, to a policy of allowing fires to burn and even lighting fires where they can be controlled to mimic the effects of natural fire. MacCleery (1995) reviews the history of American forests since European settlement from the standpoint of forest product use. In 1600, forests covered approximately one billion acres, about half the U.S. land area. Since that time, approximately one third of this area has been converted to other uses, primarily agriculture (MacCleery, 1995). Per capita use of lumber peaked in 1905 and has since declined. In the early twentieth century the conservation movement began to point out that at current rates of harvest, 80 percent of the nation's forest land would be gone by the middle of the twentieth century (MacCleery, 1995). In the context of this concern over the loss of timber for human use, the 1902 Yacolt fires burned over one million acres of primarily private timberland and took 36 lives. This event led to the formation of private fire protection associations and supported the view that all fires must be suppressed.

According to Davis (2001), the national fire suppression policy appeared to be effective for many years. From 1956 through 1996, the number of acres burned on national forest lands ranged from two million to seven million acres, down from an average of ten million acres over the first half of the twentieth century. Beginning in the 1960's evidence began to gather that the policy of suppressing all wildfires was having unintended consequences. The 1963 Leopold Report pointed out that the suppression of all fires was leading to build up of flammable vegetation and could lead to larger fires in the future (Davis, 2001). Some early forest ecologists viewed fire as a natural part of forest ecology. The buildup of fuels and their role in contributing to famous wildfire disasters, such as the Yellowstone fires of 1988, the Oakland Hills fire of 1991, and the 2000 Cerro Grande fire in Los Alamos, New Mexico is discussed by Coen (2003). At the same time that forests are becoming more flammable, increasing numbers of people are choosing to build their homes in the forest. The problem is particularly severe in high-growth Western States, such as Idaho, Colorado, Arizona, and Nevada, where dry forest fuels surround millions of homes (Davis, 2001). Residents of the area where urban development meets or intermingles with forest vegetation, known as the wildland urban interface, move there for a variety of reasons. Some may be seeking a rural lifestyle in a natural setting; others may be attracted to lower land costs and property taxes in rural areas; still others may be attracted to the lack of zoning requirements and regulations that characterize some rural counties. Whatever the reasons, the result of intermingling a growing population with an increasingly flammable forest has been increased property damage and loss of lives.

The preference to live in areas subject to natural hazards is not unique to Washington State, nor to wildfire hazard areas. Many people continue to choose to live in

areas exposed to all natural hazards, such as barrier islands, floodplains and earthquake faults (Cutter, 2001). The January 2005 Indian Ocean tsunami disaster is the most recent and devastating example of the consequences of increasing human populations in areas subject to natural hazards.

CWCH (2001) provides a comprehensive analysis of the relationship between wildfire and poverty across the U.S. CWCH estimates “that 3-5 million of the 10-15 million residents in the urban-rural wildfire interface lack adequate resources to protect themselves from wildfire. Wildfires intensify poverty by having a pervasive, disproportionately negative impact on those households lacking adequate resources to reduce the flammability of nearby wildlands, fire-proof homes and other structures, respond quickly when wildfires occur, and recover from economic losses resulting from fires” (CWCH, 2001 pg 1). Fires impact these families directly, through damage to property, disruption of lives through evacuations, and through loss of jobs, and indirectly through changes to the ecosystem (CWCH, 2001).

Current national policy initiatives to address the impacts of fires to communities are the National Fire Plan (NFP) and the Healthy Forests Initiative. The NFP was initiated by President Clinton in 2000, following the severe fire season that year. Over 6.5 million acres were burned in that year, including fires that threatened to burn the Los Alamos, New Mexico and Hanford, Washington nuclear research laboratories (United States Department of Agriculture and United States Department of Interior, 2000). The National Fire Plan recognized the significance of communities as part of the wildfire problem and as an integral part of solutions to the problem. The key points and recommendations of the National Plan were:

- 1. Continue to Make All Necessary Firefighting Resources Available.*

As a first priority, the Departments will continue to provide all necessary resources to ensure that fire suppression efforts are at maximum efficiency in order to protect life and property. The United States' wildland firefighting organization is the finest in the world and deserves our strong support. To ensure continued readiness of the firefighting force, the Departments recommend providing additional resources for firefighting activities.

2. Restore Damaged Landscapes and Rebuild Communities.

After ensuring that suppression resources are sufficient, invest in the restoration of communities and landscapes impacted by the year 2000 fires. The Departments also recommend that investments in the treatment of landscapes through thinning and the restoration of fire be continued and expanded to help reduce the risk of catastrophic fires.

3. Investments in Projects to Reduce Fire Risk

As discussed above, the Departments have been implementing new approaches to address the long-term buildup of hazardous fuels in our forests and rangelands. The fires of 2000 have underscored the importance of pursuing an aggressive program to address the fuels problem with the help of local communities, particularly those in wildland-urban interface areas, where threats to lives and property are greater and the complexity and costs of treatments higher.

4. Work Directly with Local Communities.

Working with local communities is a critical element in restoring damaged landscapes and reducing fire hazards proximate to homes and communities. To accomplish this, the Departments recommend:

- a. Expanding the participation of local communities in efforts to reduce fire hazards and the use of local labor for fuels treatment and restoration work.*
- b. Improving local fire protection capabilities through financial and technical assistance to state, local, and volunteer firefighting efforts.*
- c. Assisting in the development of markets for traditionally underutilized small diameter wood as a value added outlet for removed fuels.*
- d. Encouraging a dialogue within and among communities regarding opportunities for reducing wildfire risk and expanding outreach and education to homeowners and communities about fire prevention through use of programs such as Firewise. (United States Department of Agriculture and United States Department of Interior, 2000 pg 1-3).*

The call to work with and involve communities in the NFP has been taken up by the Western Governors Association (WGA). In 2001, WGA assembled a broad stakeholder group to develop a 10-year comprehensive strategy and implementation plan for the NFP (WGA, 2001; WGA 2002). A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy (WGA, 2001) and its' complementary 10-Year Comprehensive Strategy Implementation Plan have been the basis for the Governors support of the NFP. The

Governors Comprehensive Strategy and Implementation Plan emphasize collaborative and local problem solving to address the nation's wildland fire problems. The WGA strategy identified four goals necessary to diminish the threats and consequences of severe wildland fires:

1. Improve Prevention and Suppression
2. Reduce Hazardous Fuels
3. Restore Fire Adapted Ecosystems
4. Promote Community Assistance.

The community-based approach to wildland fire issues recommended by the Governors is intended to “combine cost-effective fire preparedness and suppression to protect communities and the environment with a proactive approach that recognizes fire as part of a healthy, sustainable ecosystem” (WGA, 2001 pg 2).

The Western Governors interest in reducing the impact of wildland fires to the communities in their states has been sustained through the Bush administration. President Bush's effort to reduce the impacts of wildfires on communities is called the Healthy Forests Initiative (HFI). A key goal of HFI is to reduce the “excessive red tape” that the administration contends is limiting the ability of the U.S. Forest Service to harvest trees on federal land to reduce wildfire hazards (White House Council on Environmental Quality, 2002). In addition to this emphasis on harvesting trees on federal land, HFI continues to place emphasis on the priorities stated by WGA in their 10-year strategy to focus on reducing the risks of wildfires to communities. The Healthy Forests Restoration Act of 2003 (HFRA) [Public Law 108-148] continues to place emphasis on reducing wildfire hazards around communities by requiring that fifty percent of all federal funds for hazardous fuel reduction be spent in areas adjacent to communities at risk of wildfire.

Assessing Wildfire Hazards

Identifying communities at risk of wildfire is the responsibility of state wildland fire protection agencies. For the purpose of defining wildfire risk, Communities are defined as “a group of people living in the same locality and under the same government” (The American Heritage Dictionary of the English Language, 1969). A community is considered at risk from wildfire if it lies within the wildland-urban interface as defined in the Federal Register (FR Vol. 66, No. 3, page 43,383, August 17, 2001).

The federal register defines wildland-urban interface as

The area where humans and their development meet or intermix with wildland fuel. There are three categories of communities that meet this description.

Generally, the Federal agencies will focus on communities that are described under categories 1 and 2. For purposes of applying these categories and the subsequent criteria for evaluating risk to individual communities, a structure is understood to be either a residence or a business facility, including Federal, State, and local government facilities. Structures do not include small improvements such as fences and wildlife watering devices.

Category 1. Interface Community

The Interface Community exists where structures directly abut wildland fuels. There is a clear line of demarcation between residential, business, and public structures and wildland fuels. Wildland fuels do not generally continue into the developed area. The development density for an interface community is usually 3 or more structures per acre, with shared municipal services. Fire protection is generally provided by a local government fire department with the responsibility to protect the structure from both an

interior fire and an advancing wildland fire. An alternative definition of the interface community emphasizes a population density of 250 or more people per square mile.

Category 2. Intermix Community

The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. An alternative definition of intermix community emphasizes a population density of between 28–250 people per square mile.

Category 3. Occluded Community.

The Occluded Community generally exists in a situation, often within a city, where structures abut an island of wildland fuels (e.g., park or open space). There is a clear line of demarcation between structures and wildland fuels. The development density for an occluded community is usually similar to those found in the interface community, but the occluded area is usually less than 1,000 acres in size. Fire protection is normally provided by local government fire departments.

The approach to identifying communities at risk is defined by the National Association of State Foresters (NASF) in their “Field Guidance: Identifying and Prioritizing Communities at Risk” (NASF, 2003). The NASF guidance establishes broad

guidelines for identifying and prioritizing communities at risk for wildfire. Key elements of the NASF guidance are: using 2000 census data to identify communities that are in the wildland-urban interface and are at risk of wildfire; categorizing communities into three broad categories of risk (high, medium, low) based on state defined criteria.

Several risk assessment methodologies have been developed to evaluate the risk presented by wildland fire to homes and communities in the wildland urban interface. *FireSmart: Protecting Your Community From Wildfire* describes the wildfire hazard assessment system used in wildland urban interface areas in Alberta, Canada (Vicars, 2003). The most effective time to do hazard assessment is before residential development occurs. At that time, development plans may be modified to mitigate fire and other natural hazards. In Alberta, approval of development proposals may be withheld in areas where wildland fire hazard ratings are high or extreme (Vicars, 2003). After development and construction occur, hazard assessments may be conducted by property owners, or by fire officials as part of fire prevention education efforts. The FireSmart fire hazard assessment system contains eleven factors that assess structure and site hazards, and vegetation hazards.

Structure and site hazards, such as roofing material, roof cleanliness, building exterior materials, window and door glazing, location of nearby combustibles (firewood, building material), and setback of structures from edge of slope. Structure and site hazards describe the potential flammability of structures and are key factors in homes burning in wildfires.

Vegetation hazards including forest vegetation (larger overstory trees), surface vegetation (low growing shrubs and grasses), and ladder fuels (shrubs, small trees, and brush that carry fire from surface fuels to tree canopies). Vegetation hazards describe the

risk fires in vegetation will be carried to the home, or that a fire initiating in a home will be carried into the forest.

Other elements of the FireSmart assessment system include the potential for human or natural lightning fires, site aspect (the direction the site is facing relative to the sun), chimneys, use of household debris burning as a waste disposal method, presence of overhead powerlines (that could break and ignite a fire). Fire protection capabilities are also considered in the assessment process. Key fire protection considerations are response time to a fire, access of fire equipment to structures, and availability of water supplies.

An assessment methodology frequently used in the U.S. is the National Fire Protection Association's (NFPA) standard, *NFPA 299: Standard for Protection of Life and Property from Wildfire* (NFPA, 1997). NFPA 299 was first developed following the disastrous wildfires in 1985 in which 1,400 homes were destroyed and 44 lives were lost. The purpose of NFPA 299 is to "provide criteria for fire agencies, land use planners, architects, developers, and local government for fire-safe development in areas that may be threatened by wildfire" (NFPA, 1997 pg 1).

NFPA 299 (NFPA, 1997 pg 5-6) describes the following elements for a "Wildfire Hazard Severity Analysis of Improved Property":

Weather History. The history of local weather, including wind factors, relative humidity, temperatures, and fine fuel moistures shall be considered in the elements determining defensible space.

Fuels. All vegetative fuels and other combustible materials shall be evaluated for their potential to contribute to the intensity and spread of wildfire.

Structures. A structure that lacks external fire-resistant features shall be

deemed to increase the risk from the spread of wildfire to life and improved property, and the risk of fires on improved property spreading to wildland fuels.

Slope and Aspect. Slope and aspect shall be evaluated as to their potential to increase the threat of wildfire to life or improved property. On hillside properties, where deemed appropriate by the authority having jurisdiction, the dimensions of defensible space shall be increased to mitigate convective and radiant heat transfer resulting from the slope and/or aspect of the property.

Fire History. The factors determining required defensible space shall include the history of wildfire behavior for the area.

Access and Evacuation. Fire-safe routes of access for emergency service apparatus and egress for vehicles shall be provided.

Identifying communities at risk is encouraged under the Healthy Forests Restoration Act of 2003(HFRA). Under HFRA, communities at risk for wildfire that develop "Community Wildfire Protection Plans" have priority for federal funding for wildfire hazard reduction projects. HFRA requires that one-half of all federal funding for hazardous fuel reduction be conducted in communities at risk for wildfire.

Mitigating Wildfire Hazards

Once hazards are assessed, there are a variety of mitigation strategies that can be applied to reduce the potential for damage. The minimum that can be done is to educate at-risk populations about the hazards, so they can make an informed decision about the costs and benefits of their behavior. Education alone has not been proven to be effective. According to Burby (1998), people tend to underestimate natural hazards, especially after

they have made the decision to live with the hazard. As people become more affluent, they may become more willing to take risks to realize their desired lifestyle (Hyde, 2005).

A second mitigation strategy is publicly funded post-disaster relief. While this strategy has been proven effective in repairing the damage caused by natural hazards, it may be counterproductive in that it actually encourages continued risky behavior (Burby, 1998). If people believe the government will make them financially whole after a disaster, they have less incentive to take personal responsibility for their actions.

Insurance as a disaster mitigation tool has some advantages over post-disaster relief. If insurance rates accurately reflect the potential for loss, then property owners will have an incentive to evaluate their risk, and make conscious decisions about living with the hazard, or taking other measures that will reduce risk. In areas of extreme hazards, insurance rates may need to be prohibitively high to reflect the risk, especially when the pool to be insured is small. In this case, many people may choose to forego insurance and ignore the risk. Burby (1998) found this to be the case with flood and earthquake insurance.

Physically reducing the hazards to structures can be effective. However, these methods can also be expensive. Rosner (2003) reported that reducing hazardous fuels around homes cost \$4,000 to \$7,000 per acre. Residents of communities at risk of wildfire may not realize the limits of activities such as fuel reduction to protect structures from wildfires (Burby, 1998). Some fires may be so severe as to overwhelm the best protection measures. Further, homeowners may not recognize the need for continued maintenance of their property to keep fuel levels safe.

Land use management has been recognized as a hazard mitigation tool since 1950, when President Truman's Water Resources Policy Commission that federal agencies

encourage zoning as an approach to reduce flood losses (Burby,1998). There are two land use management approaches, the locational approach, and the design approach. The goal of the locational approach is to limit development in hazardous areas, while the design approach encourages safe construction in hazardous areas (Burby, 1998). The land use management approach requires strong political will to implement what are frequently unpopular land use regulations. Even if strong land use regulations are implemented, effective local enforcement is needed to assure compliance.

Methodology

This study will evaluate household poverty levels of communities at high risk of wildfire in Eastern Washington. Identifying whether these communities experience high levels of poverty and comparing poverty levels to state and county wide averages will help to evaluate existing policies that are designed to help residents of wildfire hazard areas reduce fire risks, and to focus fire hazard mitigation policies to be more effective in mitigating hazards and more efficient in using public funds. For the purpose of this study, household poverty levels and median income levels of communities at risk of wildfire will be compared to the average statewide household poverty level and to the average levels of the county the community resides.

To identify and map communities at risk of wildfire and to evaluate their poverty levels, GIS (geographic information system) technology will be used. GIS technology provides a way to link “geographic information (where things are) with descriptive information (what things are)” (ESRI, 2002 pg 5). GIS allows different data sets to be assembled in layers to analyze relationships and trends. In this study, geographic information about the location of communities at high risk of wildfire will be overlaid on

a map of 2000 U.S. Census block groups. The descriptive information is the poverty levels of census block groups.

Using GIS to Assess Wildfire Hazards

Other States and national governments face the same challenge of mapping and characterizing wildfire hazards to communities as Washington State. These other efforts include the Australian Fire Hazard Mapping System, the California Division of Forestry State Responsibility Wildfire Hazard Mapping Program, the East Bay Hills Vegetative Management Consortium mapping project, and the Boulder County, Colorado Wildfire Hazard Mitigation System (Burby, 1998). Each of these systems incorporates spatial information about the location and occurrence of wildfires, information on the topographic and vegetative characteristics of the landscape, as well as information on the built environment (including location of structures, road access, and fire department capabilities). Analysis of these characteristics is conducted to identify areas of high wildfire hazard and risks to communities.

The Washington Department of Natural Resources (WDNR) has been conducting wildfire hazard assessments since 2000. The assessments determine the overall fire hazard rating of an area based on fuels, weather, terrain, structures, fire occurrence, and values at risk. Once the ratings have been established, the assessment gives fire planners specific areas to target for mitigation programs. The WDNR assessment is conducted using the Risk Assessment and Mitigation Strategies (RAMS) system developed by the U.S. Department of Interior Bureau of Land Management and according to the standards developed by the National Fire Protection Association in *NFPA 299: Standard for Protection of Life and Property from Wildfire, 1997 Edition* (NFPA, 1997).

The purpose of RAMS is to develop effective and consistent wildland fire prevention, mitigation, and hazardous fuels management programs (BLM, 2000). RAMS contains a community hazard assessment module. Key elements of the community hazard assessment in RAMS are shown in table 1.

Table 1. Key Elements of RAMS Community Hazard Assessment

Element	Characteristics
Fuels Hazard	Flammability of vegetation Potential for fires to reach tree crowns Topographic characteristics (slope steepness, elevation)
Fire Protection Capability	Initial fire suppression capability Fire Suppression Complexity
Ignition Risk factors	Population Density, Presence of Power Lines, Industrial Operations, Outdoor Recreation, Flammables Present (gas stations, natural gas lines, refineries), Incendiary, Railroads, Transportation systems, Commercial Development, Business, agricultural/ranching, Camps, resorts, stables Other factors, such as Fireworks, children with matches, Woodcutting area, power equipment, target shooting

Element	Characteristics
Community Values	Recreation, Wildlife/Fish habitat, Animal grazing Water quality, Forest/Woodland, Industrial Forest plantations, Private Property, Cultural Resources Scenic quality, Threatened or endangered plants and animals, Soils (Erosion), Air quality

For the purpose of conducting the community risk assessment in Washington, communities are delineated using the methods recommended by the National Association of State Foresters in their document *Field Guidance: Identifying and Prioritizing Communities at Risk* (NASF, 2003). The NASF guidance establishes broad guidelines for identifying and prioritizing communities at risk for wildfire. The field guidance recommends that communities be based on 2000 census data. Washington's communities are based on collections of one or more census blocks. Census blocks are the smallest area which the U.S. Census Bureau maps and collects data. Census blocks were chosen as the minimum mapping unit for delineating communities because they are consistently and objectively defined using roads, legal and topographic boundaries, they are readily available without additional expense to create maps, and most importantly, provide a link to a wide spectrum of demographic data about residents of the areas (U.S. Census Bureau, 2001). The blocks making up a community may be contained in one or more census block groups.

The RAMS community assessment module assigns a ranking of low, moderate or high fire hazard to each community. The output of the RAMS community assessment

showing the relative ranking of communities in Eastern Washington is provided in Appendix 2.

To determine household poverty rates of Communities at Risk, U.S. Census data from the 2000 Census Summary File 3 Data Tables extracted by the State of Washington Office of Financial Management were used. The Office of Financial Management files contain extracts of the most widely used items from Census 2000 Summary File 3 data, including social, economic and housing characteristics based on a sample of 1 in 6 households that received the Census 2000 long-form questionnaire (State of Washington Office of Financial Management, 2004).

The definition of poverty provided by the U.S. Census Bureau will be used for this report. The definition of poverty was created by the Social Security Administration (SSA) in 1964 based on the U.S. Department of Agriculture's 1955 Food Consumption Survey. The survey found that families of three or more spent approximately one-third of their income on food. SSA multiplied the cost of the most economical food budget for a family of three to calculate the poverty threshold. The threshold is revised annually to adjust for the increased cost of living in the consumer price index.

Poverty status is determined for all people except institutionalized people, military residing in military group quarters, college students in dormitories, and unrelated individuals less than fifteen years old. These groups are not included in the calculation of poverty. Poverty thresholds by family size and number of children are shown in table 2.

Table 2. Poverty Thresholds
Poverty Threshold in 1999, by Size of Family and Number of Related Children Under 18 Years Old
 (Dollars)

Size of family unit	Weighted average threshold	Related children under 18 years old								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual)	8501									
Under 65 years old	8667	8667								
65 years and over old and over	7990	7990								
Two people	10869									
Householder under 65 years old	11214	11156	11483							
Householder 65 years old and over	10075	10070	11440							
Three people	13290	13032	13410	13423						
Four people	17029	17184	17465	16895	16954					
Five people	20127	20723	21024	20380	19882	19578				
Six people	22727	23835	23930	23436	22964	22261	21845			
Seven people	25912	27425	27596	27006	26595	25828	24934	23953		
Eight people	28967	30673	30944	30387	29899	29206	28327	27412	27180	
Nine people or more	34417	36897	37076	36583	36169	35489	34554	33708	33499	32208

Source: U.S. Census Bureau, Current Population Survey.

Household poverty rates of Communities at Risk will be used as an indicator of community capacity to take actions to mitigate wildfire hazards in the community. According to the Center for Watershed and Community Health (2001 pg 29), “poverty, in the context of wildfires, means people and communities unable, because of inadequate financial or nonfinancial resources, to take the steps necessary to protect themselves, their families, their homes, and other assets from the risks of wildfire.” Household poverty rates are the most accessible measurement that is readily available to indicate community capacity to implement wildfire mitigation measures.

About the Analysis

Census 2000 Summary File 3 Data provides household poverty data at the block group level. Communities at risk are made up of one or more census blocks and the blocks may be in more than one block group. To estimate the household poverty for the

community, the poverty levels of each census block group represented in the community must be weighted according to the relative number of homes of the community. A weighted poverty rate is calculated for the community by summing the product of each blocks weight multiplied by its block group poverty level. An example of the process is shown for the Navarre Coulee Community in table 3.

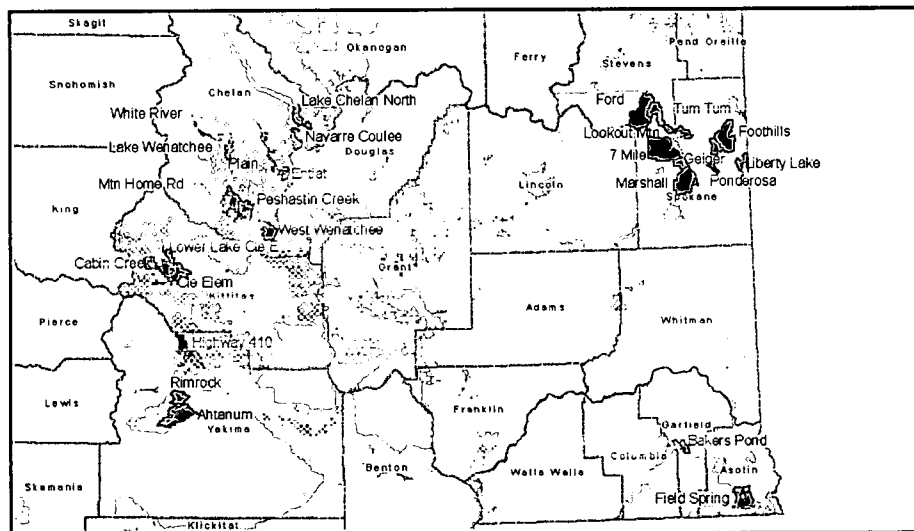
County	Community	Block Group Identifier	Block Group Poverty Rate	Census Block Identifier	Block Pop.	Pop. Weight Factor	Weighted Poverty Rate
Chelan	Navarre Coulee	530079603001	12.76	1076	91	0.2327	2.97
Chelan	Navarre Coulee	530079603001	12.76	1077	140	0.3581	4.57
Chelan	Navarre Coulee	530079603001	12.76	1080	7	0.0179	0.23
Chelan	Navarre Coulee	530079603001	12.76	1090	5	0.0128	0.16
Chelan	Navarre Coulee	530079603001	12.76	1097	8	0.0205	0.26
Chelan	Navarre Coulee	530079601002	14.02	2001	24	0.0614	0.86
Chelan	Navarre Coulee	530079601002	14.02	2004	3	0.0077	0.11
Chelan	Navarre Coulee	530079601002	14.02	2006	32	0.0818	1.15
Chelan	Navarre Coulee	530079601002	14.02	2011	8	0.0205	0.29
Chelan	Navarre Coulee	530079601002	14.02	2014	3	0.0077	0.11
Chelan	Navarre Coulee	530079601002	14.02	2018	26	0.0665	0.93
Chelan	Navarre Coulee	530079601002	14.02	2019	18	0.0460	0.65
Chelan	Navarre Coulee	530079601002	14.02	2020	14	0.0358	0.50
Chelan	Navarre Coulee	530079601002	14.02	2315	1	0.0026	0.04
Chelan	Navarre Coulee	530079601002	14.02	2319	4	0.0102	0.14
Chelan	Navarre Coulee	530079601002	14.02	2323	7	0.0179	0.25
Community Population					391		

County	Community	Block Group Identifier	Block Group Poverty Rate	Census Block Identifier	Block Pop.	Pop. Weight Factor	Weighted Poverty Rate
Community Poverty Rate							13.22

Table 3. Example of Poverty Weighting by Community - Navarre Coulee

Findings

The WDNR assessment of communities at risk of wildfire using Risk Assessment and Mitigation Strategies (RAMS) system identifies thirty-one communities at high risk of wildfire in Eastern Washington (figure 1). Overlaying the boundaries of the high wildfire hazard communities with the 2000 census blocks identifies 33,704 households with 74,022 people in the high risk communities in 1999.



Legend

- [] County Boundaries
- [] Public Lands
- [] High Wildfire Risk Communities

Figure 1. Communities with High Wildfire Hazard

For the thirty one high fire risk communities in Eastern Washington overall, the poverty level is below the average for Eastern Washington. The household poverty rate for all high risk communities is 7.8%, while the average household poverty rate for Eastern Washington is 10.7% (State of Washington Office of Financial Management, 2002). When compared to other residents of their counties, residents of high wildfire risk areas also have higher than average incomes (table 4). Even in communities that had poverty rates greater than the county average, median incomes were still above average. In Spokane County, the most populous Eastern Washington County, household poverty rates in high risk communities averaged 3.9%, well below the Eastern Washington average (10.7%) and the Spokane County average of 8.3%. For all census blocks combined in high risk communities, 8.2% of residents live in poverty.

Table 4. Median Income and Poverty Rates of Communities at Risk of Wildfires

County	Community at Risk	County Median Income	County Poverty Rate	Community at risk Median Income	Community at Risk Poverty Rate
Asotin		\$33,524	11.8		
	Field Spring			\$35,543	18.9
	Community Average			\$35,543	18.9
Chelan		\$37,316	8.8	\$41,127	8.9
	Brender Canyon			\$38,231	5.3
	Entiat			\$40,585	13.3

County	Community at Risk	County Median Income	County Poverty Rate	Community at risk Median Income	Community at Risk Poverty Rate
	Lake Chelan North			\$34,253	14.3
	Lake Wenatchee			\$40,059	9.5
	Mountain Home Road			\$49,831	4.5
	Navarre Coulee			\$42,433	13.2
	Peshastin Creek			\$44,819	3.0
	Plain			\$39,933	8.6
	West Wenatchee			\$45,067	10.9
	White River			\$40,083	9.7
	Community Average			\$41,127	8.9
Garfield		\$33,398	12.0		
	Baker's Pond			\$42,721	12.9
	Community Average			\$42,721	12.9
Kittitas		\$32,546	10.5		
	Cabin Creek			\$46,386	7.3
	Cle Elem			\$37,154	14.8
	Lower Lake Cle Elem			\$48,522	6.7
	Community Average			\$39,074	13.3
Spokane		\$37,308	8.3		
	7 Mile			\$50,410	5.9

County	Community at Risk	County Median Income	County Poverty Rate	Community at risk Median Income	Community at Risk Poverty Rate
	Foothills			\$56,557	4.7
	Geiger			\$35,403	12.0
	Liberty Lake			\$58,749	3.2
	Lookout Mountain			\$64,177	1.4
	Marshall			\$43,247	0.2
	Mullen Hill			\$57,169	5.1
	Park Road			\$53,985	4.3
	Pleasant Prairie			\$56,568	6.1
	Ponderosa			\$58,484	1.2
	Community Average			\$52,666	3.9
Stevens		\$34,673	11.6		
	Ford			\$32,172	23.7
	Suncrest			\$57,989	1.3
	Tum Tum			\$39,477	16.7
	Community Average			\$46,552	11.1
Yakima		\$34,828	14.8		
	Ahtanum			\$39,609	3.4
	Highway 410			\$38,072	10.0
	Rimrock			\$38,264	3.9

County	Community at Risk	County Median Income	County Poverty Rate	Community at risk Median Income	Community at Risk Poverty Rate
Community Average				\$38,582	7.6

Conclusions and Policy Recommendations

In twenty-four of the thirty-one high risk communities, poverty rates were lower than the Eastern Washington average. In Spokane County, the most populous Eastern Washington county, poverty rates of high wildfire risk communities are significantly lower than the statewide average. The finding that most communities at high risk of wildfires have relatively lower rates of poverty than other areas of Eastern Washington has several significant policy implications.

First, it may not be reasonable to single out residents of high wildfire risk communities for financial assistance to solve their fire problems. The residents of high risk communities are relatively affluent compared to their neighbors, and it may be that their less affluent neighbors in low fire hazard areas have needs that are at least as pressing as fire hazard reduction. While increased taxes are seldom popular, residents of high wildfire risk communities are more likely than their neighbors to be able to pay for the public services necessary to provide adequate fire protection.

The most popular and widely distributed education program for community wildfire hazard reduction, the Firewise program, is targeted primarily at middle class homeowners. Given the lower than average poverty levels of the high risk community

residents, they seem well suited to the Firewise program. In the areas with higher poverty levels, other strategies, including direct financial assistance may be appropriate.

There are many governmental and nongovernmental players involved with wildfire protection, or with a stake reducing the impact of wildfires on communities. The finding that Eastern Washington communities at high risk of wildfire have generally lower than average household poverty will have significance for many of these policy actors. Policy recommendations for each of the policy players are provided.

Policy Recommendations

Residents of communities at high risk of wildfire

The finding that residents of communities at high risk of wildfire in Eastern Washington have lower than average poverty rates and higher than average median incomes compared to the other residents of their counties is significant. The residents of high risk areas could afford to live in other areas of the county, but they have made a choice to live in areas at high risk of wildfire. In return for the benefits of living in a rural, forested environment, the residents of these areas must also bear the liabilities. One of these liabilities is the risk that wildfire will destroy their homes.

High risk homeowners should not expect the general public to bear the cost of their fire protection or the mitigation measure to reduce fire hazards around their home. Residents of these areas need to seek out and obtain technical advice on the actions they can take to reduce the risk of wildfires to their communities. They may need to support higher taxes to fund improvements in their local fire department's capabilities, and they will need to pay for home and landscaping improvements to reduce the ignitability of their homes.

U.S. Forest Service (USFS)

The USFS is the federal agency with the greatest responsibility for protection of communities at risk of wildland fire. Section 103 of the Healthy Forests Restoration Act of 2003 (HFRA) directs the USFS to “develop an annual program of work for Federal land that gives priority to authorized hazardous fuel reduction projects that provide for the protection of at-risk communities or watersheds or that implement community wildfire protection plans.” To meet the USFS' direction under HFRA to give priority to communities at risk, the USFS is required to spend fifty percent of its budget for hazardous fuel reduction projects in areas adjacent to communities at risk. Since the residents of communities at high risk of wildfire have lower than average poverty rates, USFS efforts to reduce fire risks should not be placed on hazard reduction activities around homes that the landowners can afford to accomplish themselves. Rather effort should be placed in reducing hazardous fuels and fire risk in the forested areas between the communities at risk of wildfires and the national forests. Since the residents of the high risk areas in Eastern Washington do not have high poverty rates, these residents should, generally, be expected to reduce fire hazards immediately around their homes. USFS efforts to reduce fire hazards in the wildlands will have a greater benefit to reducing the risk of fires to wider areas, and will provide economic benefits, through fuel reduction projects, to the other residents of the counties with high risk communities, where poverty rates are higher than in the high risk communities.

State forestry agency

In most states, the state forestry agency, such as WDNR, is charged with providing fire protection to privately owned forest land. Throughout much of the Western

U.S. these private forest lands are bordered on one side by communities and on the other side by more remote federal forest lands. These areas of state fire protection are caught in the middle between communities where human caused fires start and where high value homes are at risk, and remote national forests where lightning caused fires grow to large size and threaten private forestland and communities.

The presence of homes adjacent and intermingled with forest land makes wildland fire protection more expensive and dangerous. While the state is charged only with protecting the forest, not structures, the presence of homes in the forest complicates fire suppression efforts. When a wildfire occurs in or near a community the residents may need to be evacuated, and some of the work to reduce hazardous fuels around structures may need to be done quickly ahead of an approaching wildfire. These actions take away from efforts to extinguish wildfires, and allow fires to become larger and ultimately more expensive to suppress.

WDNR should focus efforts on education and technical assistance. Education efforts need to include residents of high risk communities, as well as local and state political leaders, to raise awareness of 1) the personal responsibility residents of high risk areas bear for their own safety, and 2) the additional cost borne by the state treasury to provide forest fire protection in these areas.

County commissioners

All the thirty one high risk communities are in rural, unincorporated areas of Eastern Washington. County government is primarily responsible for public services and public safety in the high risk communities. Counties need to consider the impact that high risk communities are placing on public services throughout the counties. Population

growth in rural areas brings along the expectation of urban level services for fire protection, road maintenance, and schools in areas where the infrastructure does not exist. If growth is paying for this increased level of services, all may be well. Without additional funding, existing public resources must be stretched to provide services to the high risk communities. The implication of this is that services are degraded in other (and often higher poverty) areas of the county to provide services to the (relatively affluent) high wildfire risk communities.

While neither of these options are popular, counties should consider zoning restrictions to limit development in high wildfire risk areas, as is already done in flood zones in many areas, and levying taxes and development fees to assure that population growth pays its share of new public services.

Local fire departments

Local fire departments are responsible for protecting structures and property improvements, while WDNR is responsible for forest fires. In areas where homes and flammable forest vegetation intermingle, fire protection responsibilities are blurred. A fire may start in a home and burn into the forest, or forest fires may burn structures. As a result, local fire departments are involved in forest fire suppression in cooperation with WDNR in the high risk communities. Residents of high risk communities may believe that the fire department will always be there to respond to any emergency. Often, rural fire departments have limited capacity to respond to even basic fire and emergency service calls. Their capacity is further stretched when homes are widely dispersed with poor road access, as may be the case in communities at high risk for wildfire.

The expectation that local fire departments provide a high level of wildland fire protection, in addition to the service provided by WDNR, places financial strain on departments that are frequently, poorly funded and staffed mostly by volunteers. Fire departments need to educate their constituents about the financial and physical limits to the fire department's ability to protect residents from wildfires. Residents also need to be made aware of their personal responsibility to provide for their own fire safety by taking actions to reduce the risks presented by wildland fire to their homes.

Landscape industry

Appropriate fire resistant landscaping around homes located in communities at high risk of wildfire will be a large part of mitigating wildfire hazards in these communities. Providing consulting, as well as growing and installing fire resistant plant materials represents a significant business opportunity for landscapers, arborists, landscape architects, and others in the green industry. A coordinated effort by the green industry associations is needed to raise their customers' awareness of the need for fire resistant landscaping, as well as the industry's awareness of this emerging market opportunity.

Insurance industry

Wildfire risks to communities are gaining the interests of the insurance industry. The 2003 California wildfires resulted in over 19,000 claims for an insured loss of over \$2.5 billion (France, 2004). Insurers should work with fire protection agencies to educate homeowners about the risks associated with living in areas where wildfires occur. The industry could also provide expertise to county commissions in the drafting and development of building codes and ordinances.

Finally, the insurance industry could require homeowners in high risk communities to undertake hazard mitigation measures or lose their insurance. As long as homeowners are able to obtain insurance at reasonable rates they will be led to believe that their risk is limited. If insurers began canceling policies of homeowners who fail to reduce fire hazards around their homes, it would send a strong message to the community about the seriousness of the fire problem in high risk communities.

Final Observations and Recommendations for Further Research

The research results do not support the original hypothesis that residents of communities at high risk of wildfire in Eastern Washington experience higher rates of poverty than residents of other areas of the state. The question was based on the finding by the Center for Watershed and Community Health that one third of the residents of wildland urban interface areas live in poverty, and on the researcher's bias based on subjective observations of low income areas in Eastern Washington. While the finding that Eastern Washington communities at high risk of wildfire do not have higher than average poverty does provide a basis for policy development and for program implementation, several areas of further research could provide more clarity to the issue. Another possible bias is in the scope of the WDNR fire hazard assessment. WDNR's assessment identified communities at high risk of wildfire on forest land receiving fire protection from WDNR. There are other areas where wildfires occur that WDNR does provide fire protection, including the Yakama and Colville Indian Reservations. If these areas, which have household poverty rates of over twenty percent, have communities at high risk of wildfire, then the overall poverty rate for high risk communities could rise significantly.

Further research will be necessary to quantify just why the communities are at high risk and why poverty rates are relatively low in those areas. Are higher income homeowners drawn to areas where larger parcels of land are available, which may be in more remote and flammable forest areas? Are homeowners in high risk areas drawn to amenities, such as the commanding views offered by homes on ridge tops, which are also areas where fires spread rapidly uphill? Are higher income homeowners more likely to build their homes from more expensive, but more flammable, materials or construction methods (such as cedar roofing and siding material) than other homeowners? Some of these questions could be answered by use of secondary data through analysis of the results of the WDNR fire hazard assessment.

A longitudinal study of changes in population and in wildfire risk over time may be helpful to identify whether wildfire risk in communities increases or decreases as communities develop and grow. If the risk of fire changes over time as more people come into a community, and as more infrastructure is developed in the community, then policy makers may be able to determine whether communities face the same wildfire problems over time, or if the problem declines as the community is built up.

Comparison of Eastern Washington high risk communities with other similar areas in other states to see whether the characteristics of Washington's communities are unique and if so, why are they different. Based on CWCH's reported finding that one third of residents in wildland urban interface areas live in poverty, it would appear that Eastern Washington high risk communities may be the exception to the rule.

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