Idaho Public Health Jurisdictional Risk Assessment

South Central Health District (PHD5)

University of Idaho
HAZARDS RESEARCH GROUP

IDAHO Department of Health and Welfare

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I. Executive Summary

The Idaho Department of Health and Welfare and the University of Idaho partnered with the Idaho Geospatial Office and Idaho's local Public Health Districts (PHDs) to conduct a statewide Jurisdictional Risk Assessment (JRA) as mandated by the Office of the Assistant Secretary for Preparedness and Response and the Center for Disease Control. This JRA identified and assessed potential hazards and vulnerabilities pertinent to the PHDs within the context of public health, medical and mental/behavioral systems, and the functional needs of at-risk individuals.

Building on the 2011 Texas JRA, the Idaho JRA brought together expertise and collaborators from local, regional, and state levels of public health institutions and agencies in conjunction with emergency management and academic advisors. In accordance to collaborator input, the Idaho JRA improved on the Texas JRA by employing numerous models and methods to assess multiple hazard severities and probabilities, quantitatively analyze socioeconomic vulnerability at census-block level, garner local feedback regarding hazard impacts on public health systems, and assess district mitigation capabilities.

Within each report, more detailed information can be found regarding the assessment, the methodologies and tools employed throughout the analysis, and the collected results. One of the goals of the JRA is that it proves useful to community and public health officials in their ongoing efforts to find and mitigate gaps in public health's ability to minimize the impacts of natural hazards. In part this can be accomplished by more effectively allocating resources and by targeting specific areas and populations with the highest susceptibility to impacts on the public health system stemming from the following hazards:

- Flood
- Wildland Fire
- Earthquake
- Landslide
- HAZMAT Incidents
- Pandemic Influenza

II. Introduction

The intersection of induced hazards (natural and human) and human populations creates the potential for natural disasters and often synergistic cascading effects such as public health issues that may lead to loss of life, human suffering, and damage to property. Due to natural resources availability and other incentives, human growth and development historically occurs in areas susceptible to natural hazards (along coast, rivers and streams, etc.). Climate change is also likely to magnify the impacts of existing natural disasters and create new incidents of hazardous exposure in areas currently thought to be at low risk. Increased exposure to these hazards will lead to increased community vulnerability and potential for loss (Cutter, 2003; Turner et al., 2003; Adger, 2006).

Vulnerability is defined as a function of exposure, sensitivity, and adaptive capacity. Exposure is the proximity of a community to a hazard, sensitivity is the degree to which a community is affected by a hazard, and adaptive capacity is defined as the ability of the community to adjust and cope with the effects of the hazard (Brooks, 2003; Füssel, 2007). Resilience is a function of a societyôs ability to react effectively to a crisis with minimal reliance on outside aid (Tobin, 1999; Wu et al., 2002; Turner et al., 2003; Rose, 2007) and can occur across a variety of spatial scales. Increased resilience leads to lower community vulnerability.

Mitigation and adaptation policies and plans are designed to help reduce community vulnerability to hazard impacts, as well as minimize the cost of recovery from disasters. Hazard mitigation practices include planning, hazard identification and profiling, vulnerability and risk assessments, and implementation of mitigation actions (Burby, 1999; Godschalk et al., 1999; Burby et al., 2000; Cutter et al., 2003; Godschalk, 2003; Berke & Smith, 2009).

Hazard vulnerability assessments are essentially conducted at three different levels of evaluation: hazard identification, vulnerability analysis, and risk analysis. Hazard identification is defining where the hazard is likely to transpire and calculating the probability of that occurring. Vulnerability analyses look at what factors cause populations to experience increased or decreased vulnerability to hazards in certain places. Risk analysis goes one step further than the previous two levels and looks at the actual probabilities of a hazard occurring and probabilities of the levels of damage or injuries that could occur in specific areas (Burby, 1998).

The U.S. Department of Health and Human Servicesô (DHHS) Office of the Assistant Secretary for Preparedness and Response (ASPR) Hospital Preparedness Program (HPP) and Centers for Disease Control and Prevention (CDC) Public Health Emergency Preparedness (PHEP) Cooperative Agreements require state awardees to conduct jurisdictional risk assessments (JRA). The Idaho Department of Health and Welfare (IDHW), University of Idaho (UI), the Idaho Geospatial Office (IGO), and Idaho's local Public Health Districts (PHDs) collaborated to conduct jurisdictional risk assessments (JRA) that will aid State and local public health departments in identifying potential hazards, vulnerabilities, and risks within the community that are related to public health, medical, and mental/behavioral systems.

III. Jurisdictional Risk Assessment (JRA)

This Jurisdictional Risk Assessment (JRA) identifies potential hazards, vulnerabilities, and risks within Idaho Public Health Districts (PHDs) that relate to the public health, medical, and mental/behavioral systems and the functional needs of at-risk individuals. With all JRAs, federal requirements state that communities must have 15 Public Health Preparedness Capabilities that enable them better prepare themselves for preventing, responding to, and recovering quickly from public health threats. This data-driven JRA aimed to enhance the Community Preparedness Capability.

In order to enhance the Community Preparedness Capability with this JRA, various steps have been taken. For each Idaho PHD and the counties that lie geographically within each jurisdiction, potential hazards, vulnerabilities, and risks related to health systems were identified through Geographic Information Systems (GIS) and other mechanisms, as well as their relationships to human impact and the interruption of health services. Moreover, this JRA ascertained the impact of the risk on health system infrastructure, such as clean water and sanitation. Communities provided capability measures that aimed to mitigate these preceding risks. This JRA identified gaps in these mitigation efforts that can be addressed to further enhance their Community Preparedness Capability. In consideration of the abovementioned process, this JRA also provides a Residual Risk analysis. Residual Risk is defined as the risk that remains after mitigation measures have been implemented.

In the next sections of this JRA report, the hazards chosen for this JRA will be explained. This will be followed by an explanation of the JRA equation, its components and all methodologies. The results of each JRA analysis for Idaho's Idaho Public Health Districts and counties will be explicated in the subsequent section, followed by executive summaries of each jurisdiction that will conclude this JRA report.

IV. Hazards

The hazards that were used for this JRA assessment were chosen through collaboration between the University of Idaho, the Idaho Department of Health and Welfare, and each PHD. Additionally, these hazards had spatial and/or statistical data that was readily available, adding to the quality of this JRA assessment. The hazards for this Idaho JRA are:

- Floods
- Wildland Fires
- Earthquakes
- Hazardous Material Spills
- Pandemic Influenza
- Landslide

Each hazard is described below using the content of the State of Idaho Hazard Mitigation Plan.

i. Floods

Flooding is the partial or complete inundation of normally dry land. Types of flooding experienced in Idaho are numerous and include: riverine flooding, flash floods, alluvial fan flooding, ice/debris jam flooding, levee/dam/canal breaks, stormwater, and mudflows (especially after a wildfire). Flooding has produced the most property damaging and costly disasters in Idaho, and significant events have occurred regularly throughout the history of the State. There is often no sharp distinction between the various types of flood events. Nevertheless, these types of floods are widely recognized and helpful in considering not only the range of flood risk but also appropriate responses.

The land along a river that is identified as being susceptible to flooding is called the floodplain. The Federal standard for floodplain management under the National Flood Insurance Program (NFIP) is the ŉbase floodplainò (also known as the 100-year floodplain, 1% annual chance floodplain, and Special Flood Hazard Area [SFHA]). This area is determined using historical data indicating that in any given year there is a 1% chance of the base flood occurring.

ii. Wildland Fires

Wildfires occur when all of the necessary elements of a fire triangle come together in a wooded or grassy area: an ignition source is brought into contact with a combustible material, such as vegetation, that is subjected to sufficient heat and has an adequate supply of oxygen from the ambient air. The hazard of wildfire is one that is significant not only in Idaho but in many areas of the United States. A wildfire front is the portion sustaining continuous flaming combustion, where unburned material meets active flames, or the smoldering transition between unburned and burned material. As the front approaches, the fire heats both the surrounding air and woody material through convection and thermal radiation. First, wood is dried as water is vaporized at a temperature of 212°F. Next, the pyrolysis of wood at 450°F releases flammable gases. Finally, wood can smolder at 720°F or, when heated sufficiently, ignite at 1,000°F. Even before the flames of a wildfire arrive at a particular location, heat transfer from the wildfire front warms the air to 1,470°F, which pre-heats and dries flammable materials, causing materials to ignite faster and allowing the fire to spread faster. High-temperature and long-duration surface wildfires may encourage flashover or torching: the drying of tree canopies and their subsequent ignition from below.

iii. Earthquakes

Idahoôs earthquakes result from three causes:

- Plate Tectonics
- Crustal Stretching
- Hotspot/Volcanic Activity

The surface of the earth (the crust) is made up of large masses, referred to as tectonic plates. Many of the worldôs earthquakes result from forces along the margins of these tectonic plates. These earthquakes occur when pressure resulting from these forces is released in a sudden burst of motion. Such earthquakes are produced in coastal California, Oregon, and Washington. The largest of these distant events may be felt in Idaho.

However, most earthquakes in Idaho have origins (the epicenter) far from plate boundaries. Much of the earthôs crust in southern and central Idaho has undergone tremendous stretching, resulting in parallel, linear mountains and valleys. This region is called the Basin and Range and extends into the adjoining States of Montana, Utah, Wyoming, and Nevada. Basin and Range stretching is continuing today. Earthquakes from these crustal movements can also cause severe ground shaking in Idaho.

Finally, Idaho earthquakes may be associated with magmatic activity. This activity is associated with the ñYellowstone Hotspot.ò The hotspot is a conduit carrying molten rock (magma) from deep within the earth into the crust. Pressures within the hotspot zone lead to earthquakes. Although there are currently no surface releases of magma through volcanoes or volcanic vents, the hotspot is very seismically active. Dozens of small earthquakes are recorded in the Yellowstone region each month.

iv. Hazardous Material Spills

Substances that, because of their chemical or physical characteristics, are hazardous to humans and living organisms, property, and the environment, are regulated by the U.S. Environmental Protection Agency (EPA) and, when transported in commerce, by the U.S. Department of Transportation (DOT).

The EPA chooses to specifically list substances as hazardous and extremely hazardous, rather than providing objective definitions. Hazardous substances, as listed, are generally materials that, if released into the environment, tend to persist for long periods and pose long-term health hazards for living organisms. Extremely hazardous substances, while also generally toxic materials, represent acute health hazards that, when released, are immediately dangerous to the lives of humans and animals and cause serious damage to the environment. When facilities have these materials in quantities at or above the threshold planning quantity (TPQ), they must submit ñTier IIòinformation to appropriate State and/or local agencies to facilitate emergency planning.

v. Pandemic Flu

A pandemic describes an epidemic that covers a wide geographic area and affects a large proportion of the population with peak times of morbidity and mortality. Previous pandemics including smallpox, tuberculosis, SARS, HIV, West Nile Virus, and H1N1 have historically affected the United States, crossed international borders, and have even spread across populations worldwide.

As defined in Idaho Emergency Operations Plan (EOP), a yearlong pandemic without intervention could result in almost 10 million hospitalizations and an estimated 1.9 million Americans could die.2 Pandemic considerations include infection and illness, disease incubation time, how the disease spreads, and the geographic area affected. In addition, modern air travel has made it possible to spread pandemic worldwide in a very short time period. Psychological effects to consider include increased levels of anxiety and fear of contracting the disease. Implementation of epidemical reaction pertains to pandemic wave or successive waves, infection rates from baseline levels and effective control measures. Resistant bacteria and the overuse of antibiotics relate to reemergence of diseases that were once under control. Pandemic definitions below are described by the Center for Disease Control (CDC).

vi. Landslides

Landslides may be classified by both type of movement and material. An understanding of the types of landslides that occur is fundamental to assessing the landslide hazard and evaluating potential mitigation measures. The following list is a simplified differentiation based on the type of movement:

- Falls: Free falls of soil and rock with local rolling, bouncing, or sliding.
- Slides: Lateral and downslope movement of partially intact masses.
- Flows: Viscous flows of completely fragmented material, saturated with water.

Landslides can also be differentiated based the type of material involved:

- Rock: Bedrock
- Debris: Predominantly coarse material.
- Earth: Predominantly fine material.

Together, movement and material produce a composite classification scheme. For example, a free fall of bedrock is referred to as a ñrock fall,òwhile a viscous flow of predominantly fine material is referred to as an ñearth flow.òThe wettest flows are referred to as ñmud flows.òThese events may be very difficult to distinguish from heavily debris-laden flash floods and functionally are essentially the same.

V. Jurisdictional Risk Assessment (JRA) Equation Explanation

In order to identify potential hazards, vulnerabilities, and risks within the community related to public health, medical, and mental/behavioral systems and the functional needs of at-risk individuals, the following equation was used:

Residual Risk = Hazard Probability × (Severity of Consequences / Mitigation)

i. Hazard probability

Hazard probability is the likelihood that a specific type of hazard event will occur. This is calculated using historical hazard frequencies collected from historical databases, or preexisting hazard probability layers. In order to derive hazard probability, a hazard occurrence interval was calculated using:

$$T = N/n$$

where T = the occurrence interval, N = the number of years in the record of hazard events, and n = the number of hazard events

Hazard probability was then calculated using:

$$P = 1/T$$

where P = the percentage that an event will occur in a given year and T is the occurrence interval derived from the former equation.

The hazard frequencies were then converted to a five point Likert scoring scale (1-5) for easy analysis and comparison. For example, a hazard with a low risk would score a 1 or 2, whereas a hazard with a high risk may score a 4 or 5. In this JRA, we did not include the magnitude in order to calculate the vulnerability due to data limitation (some did/did not include the magnitude in our records). This methodology is comparable to that used by the Federal Emergency Management Agency (FEMA) of 100 year and 500 year floods, which are 1% of a flood occurring every given year and a .2% of a flood occurring every given year.

ii. Severity of Consequences

Severity of consequences is the product of a population's vulnerability to a hazard and the impact of the hazard on the health of the population. This variable is calculated using the following equation:

$$\textit{Severity of Consequences} = \textit{Population Vulnerability} \times \textit{Impact on Health}$$

iii. Population vulnerability

Population vulnerability can be described by two components: expected population to be impacted by a hazard event, and social vulnerability. This is measured using the Spatially Explicit Resilience and Vulnerability Model (SERV).

iv. SERV Model

The Spatially Explicit Resilience-Vulnerability (SERV) model is a vulnerability and resilience quantification model that incorporates place, spatial, and scale-specific indicators applicable for sub-county vulnerability and resilience analysis. This allows researchers to determine vulnerability scores at the census block level using all three components of vulnerability (exposure, sensitivity and adaptive capacity). The SERV model explores how the influence of individual indicators on vulnerability varies by using weighted factor scoring. The SERV model provides an improved assessment of sub-county vulnerability levels that can help communities allocate limited resources to vulnerable areas more effectively and develop adaptation strategies that can enhance sub-county resilience.

Many hazard vulnerability analyses focus only on the exposure and physical extent of a community to a hazard even though there are other socioeconomic factors that can influence a community's vulnerability. The distribution of sensitivity within a community will not be uniform throughout; certain populations, infrastructure, and areas will experience more vulnerability to certain hazards than others in the community (Morrow, 1999; Wu et al., 2002; Cutter, 2006). Socioeconomic overlay analyses have been used in storm surge, hurricane, and tsunami studies in Washington, Oregon, and Florida. The results of the GIS-based socioeconomic analysis are summarized by hazard type (fire risk, landslide risk, earthquake risk, and 100 & 500 year flood risk) for all counties in each Public Health District. The data types used for the GIS analysis focuses around three main community characteristics: 1) land-cover, 2) population, and 3) critical and essential facilities (Wood et al., 2007; Frazier et al., 2010).

The earthquake and landslide risk layers were classified using the predetermined classes from USGS, who are the creators of those data layers. Because the fire risk extents are probabilistic in nature and extend across the entire county, they were classified into classes that represent level of probability of occurrence for that hazard. These classes were then overlayed with land-cover, census data, and InfoUSA business and facilities data. Fire classes are based on those identified by the Western Wildfire Risk Assessment conducted on behalf of the Council of Western State Foresters and the Western Forestry Leadership Coalition. Class 1 indicates a 0% to 70% probability of occurrence (Low); class 2 is a 70% to 92.5% probability of occurrence (Moderate); and class 3 is a 92.5% to 100% probability of occurrence (High).

Based on the spatial overlay of National Land Cover Database (NLCD) 2001 land-cover data with the hazard extent data, the distribution of land-cover types (by area) within the three different hazard types was determined for the entire county. For the purposes of this study, certain NLDC land-cover types were aggregated into different categories: 1) developed areas of open space; 2) developed areas of low intensity; 3) developed areas of medium intensity; 4) developed areas of high intensity; 5) cultivated crops and pasture and hay classes were groups into the Agriculture land-cover type; and 6) Mining and Quarries. Determining the percentage of developed areas and agriculture land cover types can help in determining how socioeconomic patterns of development may influence a county's vulnerability to hazards. Developed areas are where the majority of the population in a county is located. Agricultural areas are historically known as areas where potential development will occur in the future. Therefore, this type of analysis determines the exposure and sensitivity of development in the present and the possible exposure and sensitivity of development in the future (Wood et al., 2007).

For the residential population analysis, 2010 Census data was used to determine the sensitivity and exposure of several social populations. In particular, this study focused on the total population and included age, race, median age, female population, single mother houses, number of households, housing capital, and tenancy.

One demographic that can affect an individual's sensitivity is age. Younger and elderly populations often require special assistance when evacuating hazardous areas. Younger populations, defined here as 5 years of age or younger, often need more assistance and direction when evacuating. Younger populations also do not have the same understanding about hazardous situations as older populations, and thus often do not know how to react. Older populations, defined as over 65 years in age, often require more assistance during evacuations due to possible mobility and health issues. These populations may also need to be evacuated to facilities with specific medical equipment or other special needs facilities.

Gender can also influence an individual's sensitivity to hazard events. Research suggests that women, in general, tend to be more likely to respond to and be prepared for hazard warnings but are more likely to suffer from posttraumatic stress due to hazard events (Wood et al., 2007). Women are also more likely to be single parents and often have lower incomes, which can make recovering from a hazard event more difficult (Morrow, 1999; Wood et al., 2007).

Tenancy is another socioeconomic factor that can affect an individual's sensitivity and exposure to hazards. Certain studies have shown that renters have less of a tendency to prepare for hazard events than homeowners. This behavior could be due to renters having lower incomes, fewer resources to recover, or a lack of concern for a property they do not personally own and care for. Homeowners are more likely to want to protect and preserve what they do own (Wood et al., 2000).

When discussing short term and long term recovery, the tax parcel base is often utilized as a monetary way to fund recovery after hazard events. For this reason, understanding the percentage of the tax parcel base within the hazard extents can help gage the resilience of a community or county and its ability to recover from these hazards (Wood et al., 2007; Frazier et al., 2010).

The sensitivity and exposure of businesses and employees is also important for understanding the sensitivity of economic assets within the hazard extents (Wood et al., 2007; Frazier et al., 2010). Understanding the percentage of employees that are in hazard zones can be used to determine potential economic fragility, while sales volume can be used to determine how much revenue might be lost if normal business is interrupted by a hazard event (Wood et al., 2007; Frazier et al., 2010). High percentages of employees in the hazard extents can signify an area that might suffer economic fragility should a hazard occur. For example, if a fire were to wipe out most of the businesses in the area, a high level of unemployment could occur overnight. As a result of these lost or damaged businesses, sales in that area would decrease because people are forced to shop elsewhere and a number of people could become unemployed. Therefore, understanding how hazards might affect the business and employee base can help identify communities or areas that might have economic recovery issues (Wood et al., 2007; Frazier et al., 2010).

Dependent population facilities include medical facilities, emergency services facilities, adult residential care centers, schools, child day care centers, correctional facilities, and religious organizations. These populations are important to take into account because moving these populations can often be difficult, as they require specific needs when evacuated from hazardous areas (Wood et al., 2007; Frazier et al., 2010). Elderly and child populations take more time to move because they require more assistance to do so. In addition, if emergency service facilities are in hazardous areas, then they are more likely to be incapacitated in a hazard event. As a result, there would be fewer emergency services available to people in need and less backup for those within those faculties themselves.

Critical and essential facilities are facilities that help keep the health, safety, and economy of the population intact. If these types of facilities are threatened or damaged by a hazard event, long-term recovery can often be delayed because the basic facilities that drive the economy, safety, and health of the community may no longer be available. Critical facilities include medical services, police and fire services, utilities, and emergency services. Essential facilities include banks, grocery stores, gas stations, and legislative bodies.

vi. Impact on Health

Impact on Health contains two different sections of health impacts: 1. Public Health and 2. Healthcare. This score is determined through a similar hazard overlay analysis that is conducted using public, healthcare, and behavioral health data variables, which rates the disaster's impact on the ability of the public health and healthcare system to respond and recover in non-baseline conditions. Baseline data for each variable, when applicable, was collected through sources such as the CDC or DSHS Center for Health and Statistics, to determine the extent of impact caused by the hazard in comparison to normal conditions. The scores are determined by comparing hazard-specific data to baseline data to score the impact on a five point Likert by county stakeholders such as Emergency Managers, Ambulance Directors, Hospital Administrators, etc. For example, if a county is assessing a flood event that causes 23 injuries requiring EMS transport, but the county itself has a baseline of 4 injuries requiring EMS transport per day, impact may be scored as 3 on a 5-point Likert scale. The indicators are as follows:

- Number of fatalities
- Population requiring general sheltering (# of people)
- Population evacuating
- Number of general shelters in place
- Small water systems effected
- Water treatment facilities effected
- Number of injuries/illnesses requiring EMS transport
- Availability of healthcare providers
- Average EMS response time
- EMS transport assets
- Licensed hospital bed capacity
- Number of dialysis stations available
- Nursing home center(s) bed capacity
- Long Term Care Facilities
- Number of emergency department visits
- Number of pharmacies available
- Qualitative Indicators. Please score the possible impact based on your local knowledge.
- Number of patients requiring oxygen in a residential setting
- Population requiring medical countermeasures
- Number of agencies/ organizations without power
- Number of houses without power
- Baseline of requested laboratory samples for testing/transport

vii. Mitigation Capabilities

Mitigation, or the capability to respond, is a measure of the ability of current Public Health Response variables, such as hospital beds, primary care givers and emergency services, to respond to and manage the impacts of a hazard event. This is based on the jurisdiction's CDC Public Health Preparedness and Healthcare Capabilities assessment and a composite score (scaled 0 to 5) based on relative weighting of each capability and its involvement in each specific hazard. This method is titled CDC PHP Capabilities Preparedness Index, and employs a quotient with a numerator that is the sum of the product of each Capability's Hazard Component multiplied by the jurisdiction's capability assessment score for the functions within the capability on a 1 to 4 scale over the denominator of the sum of products of each Capability's Hazard Component multiplied by the goal capability assessment of 4.

viii. Residual Risk

Scores for different components of population vulnerability, preparedness, and hazard probability can be used obtain an understanding of a county's overall residual risk to specific hazards through the equation:

$$\textit{Hazard Probability} \times (\textit{Severity of Consequences} / \textit{Mitigation})$$

Because these components are scored with similar scales, they can be inserted into the above equation to obtain a value of residual risk, which is the risk that remains after mitigation capabilities are removed. This value can also be interpreted on a similar 1-5 scale, with scores 1 and below being considered of little risk, and scores of 5 very at-risk, whether this is due to high probability, high severity of consequences, or little mitigation.

The Residual Risk calculation was performed for each county within the PHD, and for a variety of severity levels for the six aforementioned hazards. These scores can be used to provide an understanding of the variability in risk to hazards within a county. Additionally, because population vulnerability (SERV) scores exist at the census block level, residual risk can be re-calculated for each census block within a county to understand hazard risk at a local scale. These results create more useful maps of residual risk as opposed to county-wide maps.

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VI. Results

The following sections contain PHD and county-specific results from the JRA, including hazard probability scores, severity of consequences, mitigation capability scores, and residual risk scores in both map and table format.

For each PHD and corresponding results, summary text, maps, and tables can be found in the following order:

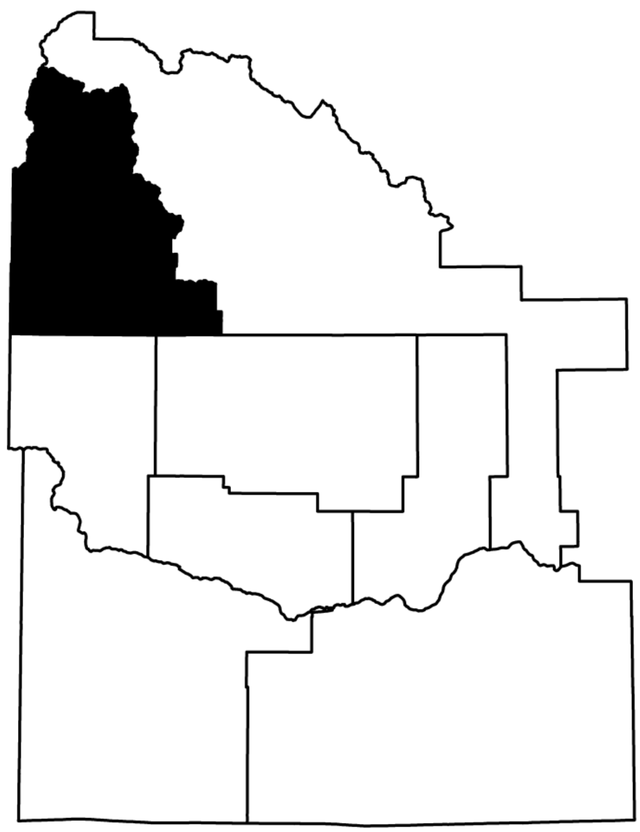
1. PHD Overview
2. Study Area Map
3. Population Density Map
4. At Risk Population Map
5. Hazard Population Exposure Table
6. Hazard Risk Probability Scoring Table
7. Capability Assessment Scoring Table
8. Influenza Pandemic Summary of Results
9. Hazard Exposure Maps
    a. Flood
    b. Fire
    c. Earthquake
    d. Landslide
    e. HAZMAT Incidents
10. Spatially Explicit Resilience Vulnerability (SERV) PHD Model Maps
    a. Flood
    b. Fire
    c. Earthquake
    d. Landslide
    e. HAZMAT Incidents
11. Residual Risk Maps
    a. Flood
    b. Fire
    c. Earthquake

    d. Landslide
    e. HAZMAT Incidents

For each county and corresponding results, summary text, maps, and tables can be found in the following order:

1. Hazard Population Exposure Table
2. Hazard Risk Probability Scoring Table
3. Hazard Impact Scoring Table
4. Hazard Risk Assessment Table
5. Population Density Map
6. Flood Exposure
    a. Hazard Event Exposure Map
    b. Critical Facilities and Businesses Exposure Map
7. Fire Exposure
    a. Hazard Event Exposure Map
    b. Critical Facilities and Businesses Exposure Map
8. Earthquake Exposure
    a. Hazard Event Exposure Map
    b. Critical Facilities and Businesses Exposure Map
9. Landslide Exposure
    a. Hazard Event Exposure Map
    b. Critical Facilities and Businesses Exposure Map
10. HAZMAT Incidents Exposure
    a. Hazard Event Exposure Map
    b. Critical Facilities and Businesses Exposure Map
11. Spatially Explicit Resilience Vulnerability (SERV) County Model Maps
    a. Flood
    b. Fire
    c. Earthquake
    d. Landslide
    e. HAZMAT Incidents

Camas County



Hazard Population Exposure - Camas County

County	Flood		Fire			Earthquake				Landslide		
	100 Year	500 Year	Low	Mod	High	Very Low	Low	Mod	High	Low	Mod	High
Blaine	492	2,597	704	1,022	1,720	80	1,888	18,758	649	20,597	763	16
Camas	112	130	324	8	22	654	1,048	69	0	1,071	46	0
Cassia	1,785	2,812	560	115	55	17,022	5,439	491	0	22,881	71	0
Gooding	2,578	3,050	131	242	202	14,994	470	0	0	15,464	0	0
Jerome	5	5	246	276	685	22,374	0	0	0	22,374	0	0
Lincoln	772	853	216	152	323	5,208	0	0	0	5,208	0	0
Minidoka	2,259	3,066	111	227	814	20,069	0	0	0	20,069	0	0
Twin Falls	415	654	1,174	282	906	75,398	1,832	0	0	76,556	0	674
Regional	8,419	13,167	3,467	2,324	4,727	155,800	10,676	19,319	649	184,221	880	689

Hazard Risk Probability Scoring Results - Camas County

Flood

County	Num. Incidents	Sum of Injuries	Sum of Exposure	Reccurence Interval	Probabillity	Risk Score
Blaine	14	No data	No data	4.64	0.22	2
Camas	3	No data	No data	21.67	0.05	1
Cassia	19	No data	No data	3.42	0.29	2
Gooding	1	No data	No data	65.00	0.02	1
Jerome	3	No data	No data	21.67	0.05	1
Lincoln	2	No data	No data	32.50	0.03	1
Minidoka	2	No data	No data	32.50	0.03	1
Twin Falls	10	No data	No data	6.50	0.15	1
Regional	54	No data	No data	1.20	0.83	5

Fire

County	Num. Incidents	Sum of Injuries	Sum of Exposure	Reccurence Interval	Probabillity	Risk Score
Blaine	20	No data	No data	3.25	0.31	2
Camas	0	No data	No data	No data	No data	No data
Cassia	30	No data	No data	2.17	0.46	3
Gooding	2	No data	No data	32.50	0.03	1
Jerome	1	No data	No data	65.00	0.02	1
Lincoln	12	No data	No data	5.42	0.18	1
Minidoka	7	No data	No data	9.29	0.11	1
Twin Falls	2	No data	No data	32.50	0.03	1
Regional	74	No data	No data	0.88	1.14	5

Earthquake

County	Num. Incidents	Sum of Injuries	Sum of Exposure	Reccurence Interval	Probabillity	Risk Score
Blaine	2	No data	No data	45.00	0.02	1
Camas	0	No data	No data	No data	No data	No data
Cassia	0	No data	No data	No data	No data	No data
Gooding	0	No data	No data	No data	No data	No data
Jerome	0	No data	No data	No data	No data	No data
Lincoln	0	No data	No data	No data	No data	No data
Minidoka	0	No data	No data	No data	No data	No data
Twin Falls	0	No data	No data	No data	No data	No data
Regional	2	No data	No data	45.00	0.02	1

HAZMAT

County	Num. Incidents	Sum of Injuries	Sum of Exposure	Reccurence Interval	Probabillity	Risk Score
Blaine	26	1	7	0.27	3.71	5
Camas	5	1	4	1.40	0.71	4
Cassia	26	13	7	0.27	3.71	5
Gooding	24	2	25	0.29	3.43	5
Jerome	41	18	84	0.17	5.86	5
Lincoln	11	1	1	0.64	1.57	5
Minidoka	27	2	3	0.26	3.86	5
Twin Falls	112	21	42	0.06	16.00	5
Regional	272	59	173	0.03	38.86	5

Pandemic Influenza

County	Risk Score
Blaine	1
Camas	1
Cassia	1
Gooding	1
Jerome	1
Lincoln	1
Minidoka	1
Twin Falls	1
Regional	1

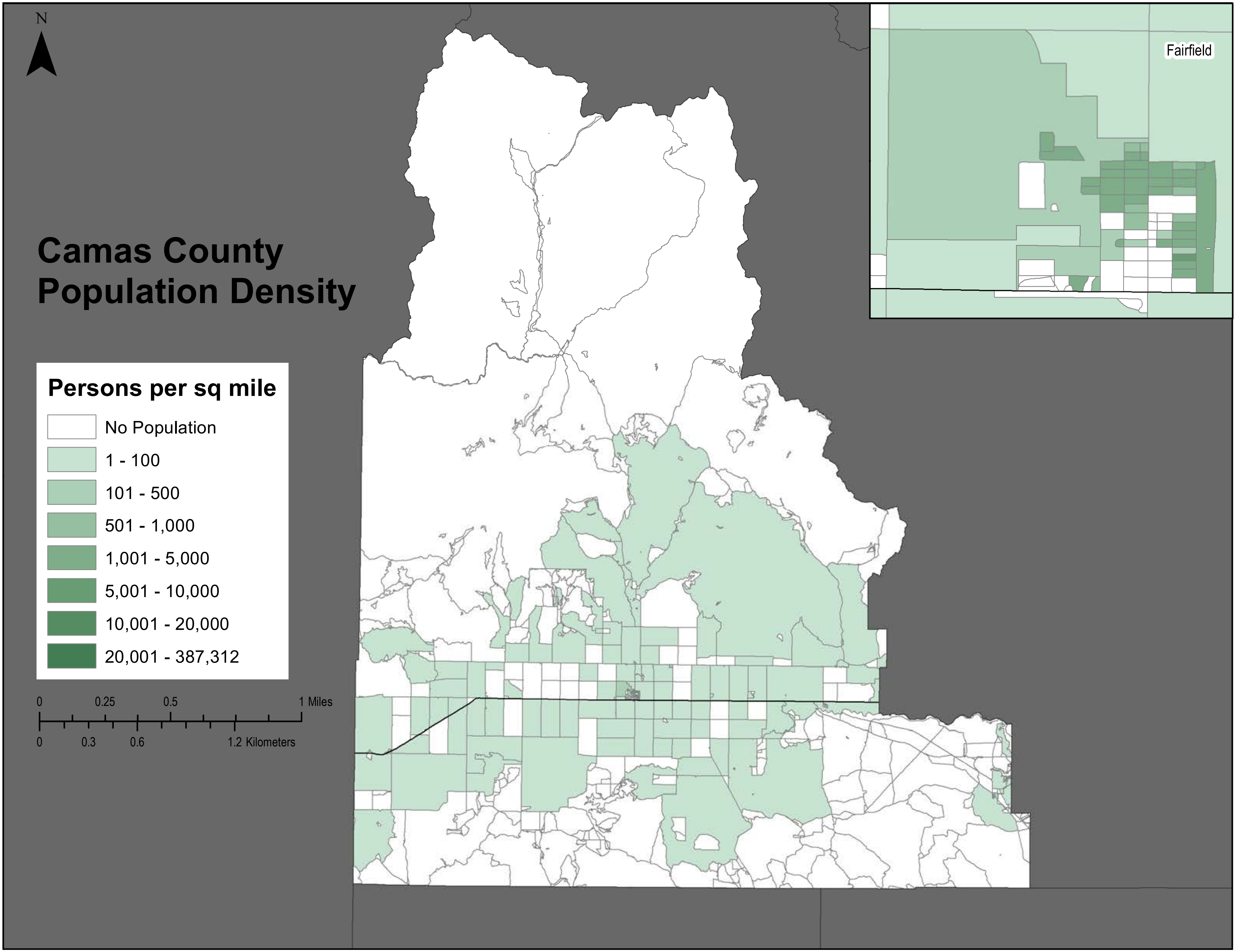
JRA Stakeholder Hazard Impact Scoring Results

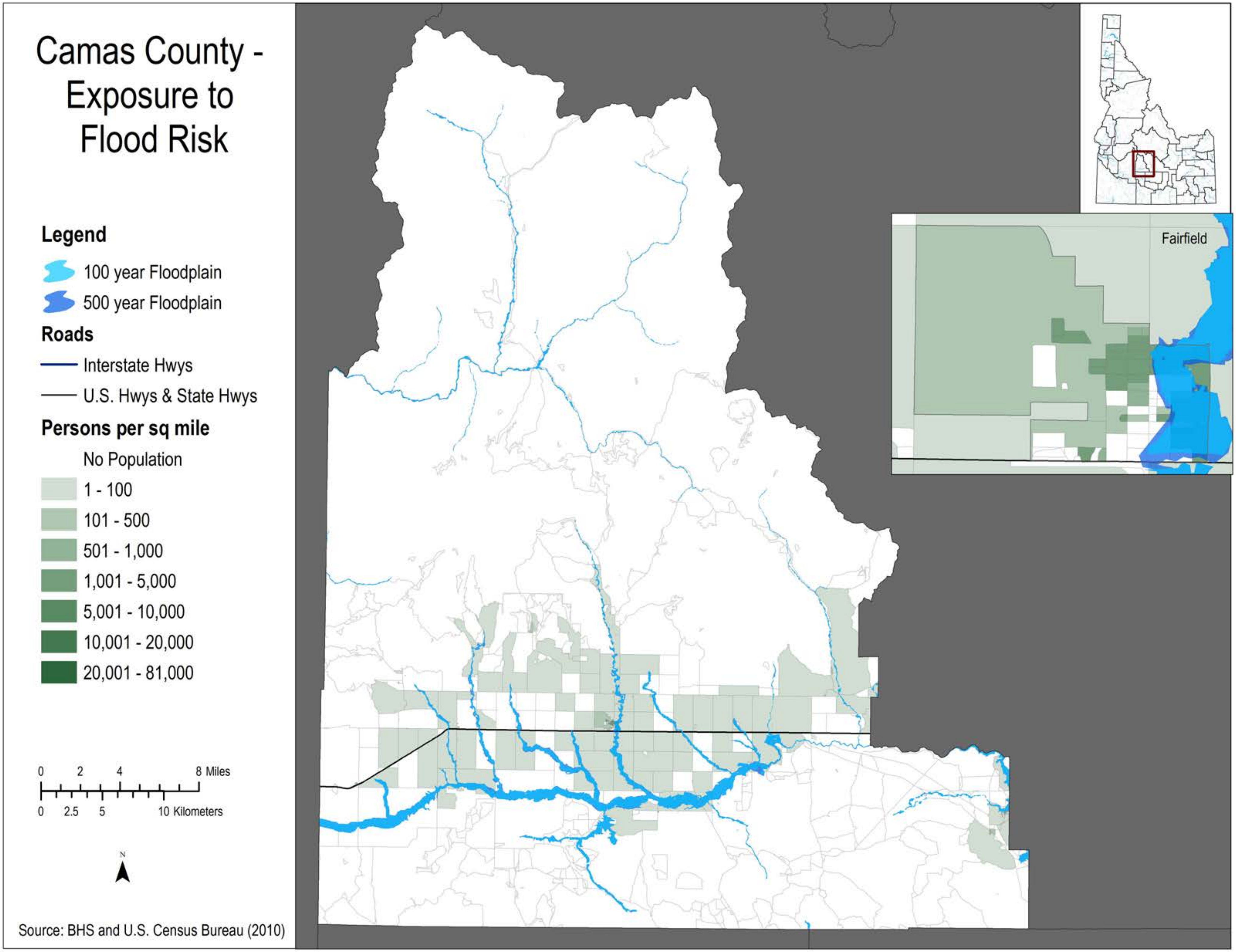
Camas County

	Earthquake				Fire Risk			Flooding Incident			Landslide			HAZMAT	Pandemic Influenza		
Indicator	Very Low	Low	Moderate	High	Low	Med	High	50yr	100yr	500yr	Low	Med	High		15%	25%	35%
Number of fatalities	0	0	1	2	0	0	1	0	1	2	0	0	1	1	0	1	2
Population requiring general sheltering (# of people)	0	0	0	1	0	1	2	0	1	2	0	0	1	0	0	0	0
Population evacuating	0	0	0	1	0	1	2	0	1	2	0	0	1	0	0	0	0
Number of general shelters in place	0	0	0	1	0	1	2	0	1	2	0	0	0	0	0	0	1
Small water systems effected	0	0	1	2	0	0	1	1	2	3	0	0	1	0	0	0	0
Water treatment facilities effected	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of injuries/illnesses requiring EMS transport	0	0	1	2	0	0	1	1	2	3	0	1	2	1	0	1	2
Availability of healthcare providers	0	0	1	2	0	0	1	1	2	3	0	0	1	1	1	2	3
Average EMS response time	0	0	1	2	0	0	1	1	2	3	0	0	1	2	0	1	2
EMS transport assets	0	0	1	2	0	0	1	0	1	2	0	0	1	1	0	1	2
Licensed hospital bed capacity	0	0	0	0	0	0	1	0	1	2	0	0	0	1	0	1	2
Number of dialysis stations available	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Nursing home center(s) bed capacity	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Long Term Care Facilities	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Number of emergency department visits	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Number of pharmacies available	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	2	3
Qualitative Indicators																	
Number of patients requiring oxygen in a residential setting	0	0	1	2	0	0	1	0	0	1	0	0	1	1	0	1	2
Population requiring medical countermeasures	0	0	1	1	0	0	1	0	0	1	0	0	0	1	0	1	2
Number of agencies/ organizations without power	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0
Number of houses without power	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0
Baseline of requested laboratory samples for testing/transport	0	0	0	1	0	0	0	0	0	1	0	0	0	2	1	2	3

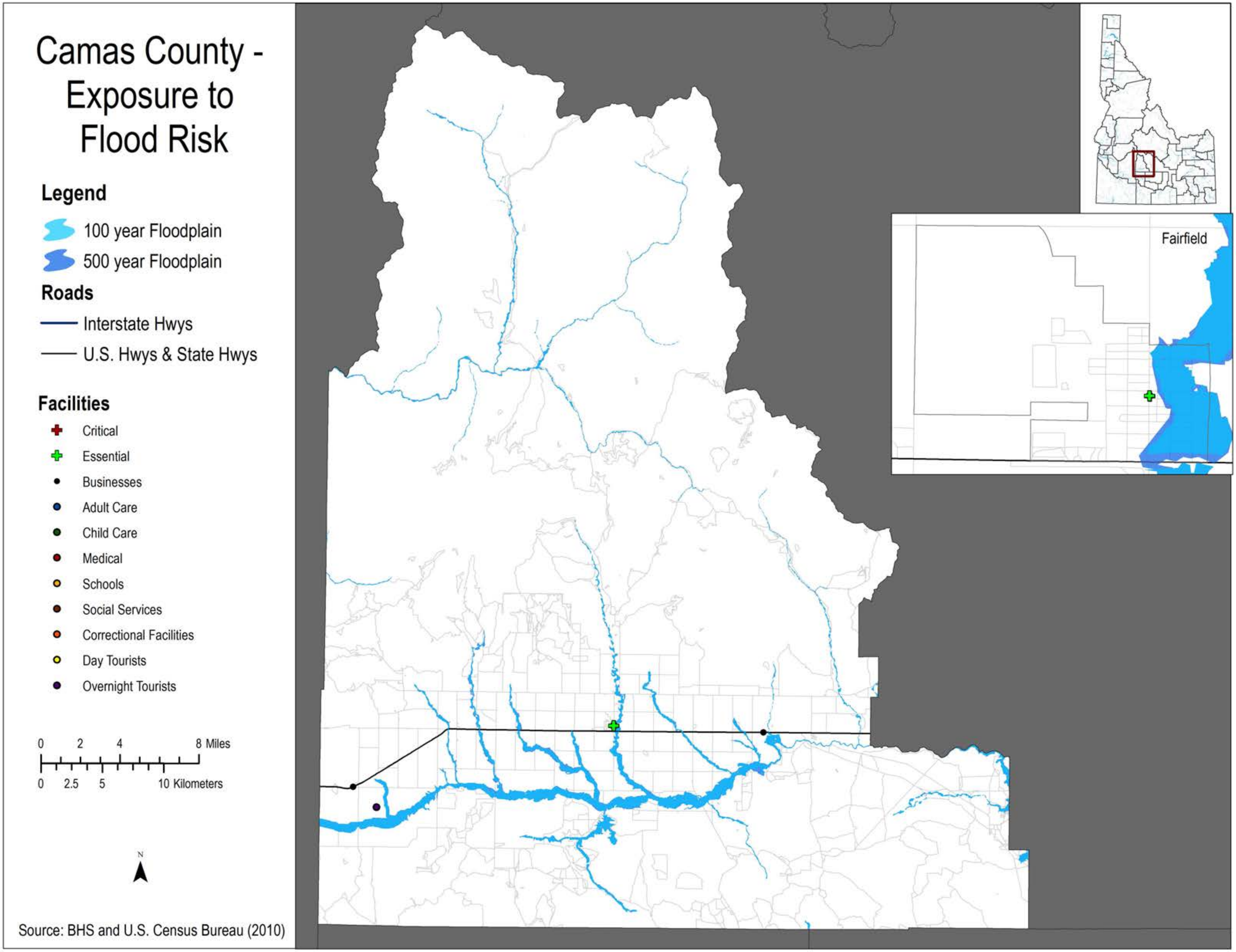
Hazard Risk Assessment - Camas County

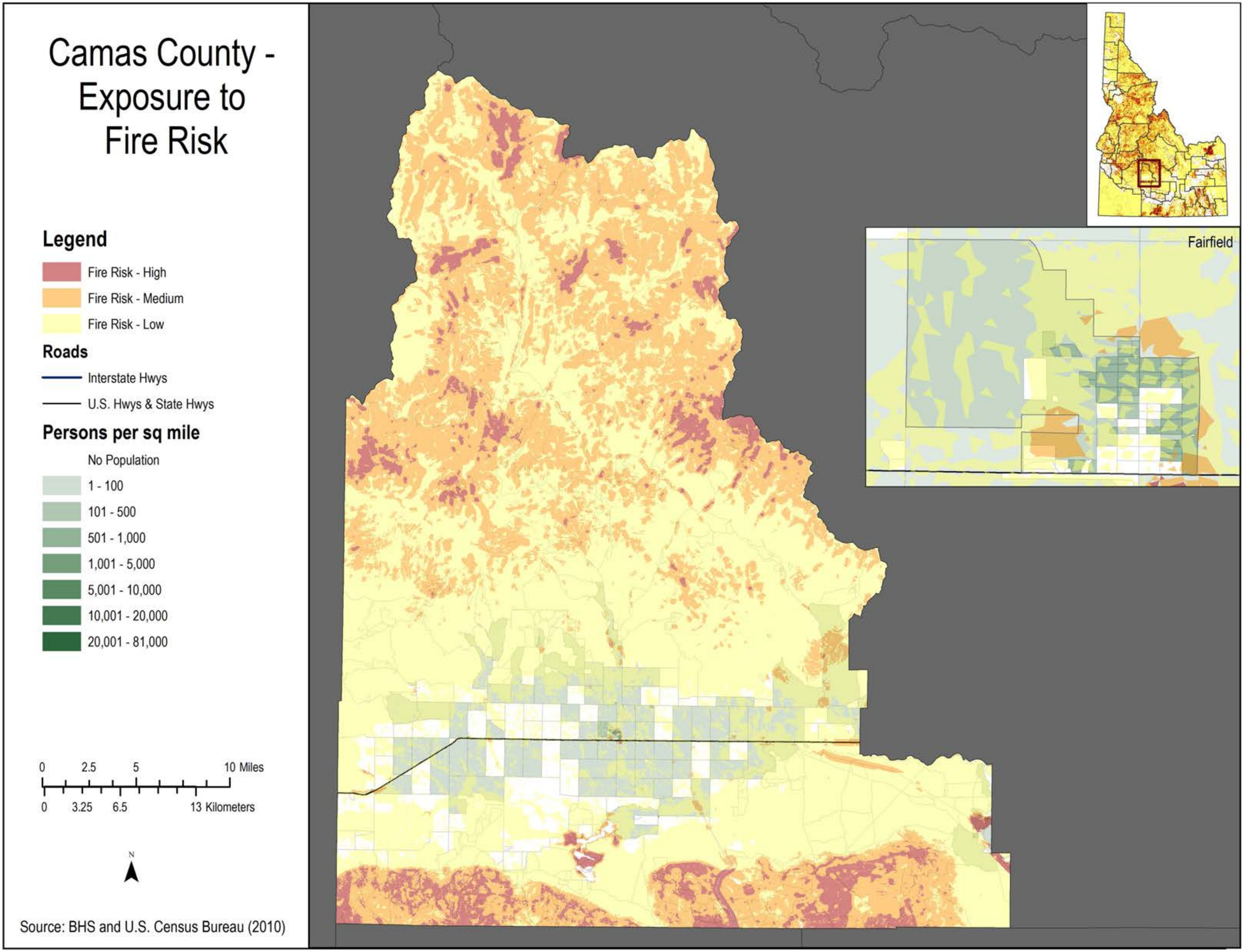
Hazard	Severity	Hazard Probability		Vulnerability	Impact on Health: Public Health Impact Score	Impact on Health: Healthcare Impact Score	Severity of Consequences		Mitigation: Public Health Capability	Mitigation: Healthcare Capability	Residual Risk
Earthquake	Very Low	No Data		4.334	0	0	1.444666667		2.99	2.05	N/A
	Low	No Data		4.334	0	0	1.444666667		2.99	2.05	N/A
	Moderate	No Data		4.334	0.641509434	0.8947368	1.956748759		2.99	2.05	N/A
	High	No Data		4.334	2.886792453	1.7894737	3.003422046		2.99	2.05	N/A
Fire Risk	Low	No Data		3.396	0	0	1.132		2.99	2.05	N/A
	Med	No Data		3.396	0.962264151	0	1.452754717		2.99	2.05	N/A
	High	No Data		3.396	3.20754717	1.7894737	2.797673618		2.99	2.05	N/A
Flooding Incident	50yr	1		3.064	0.320754717	0.4473684	1.277374379		2.99	2.05	0.15566
	100yr	1		3.064	1.924528302	1.1929825	2.060503586		2.99	2.05	0.63175
	500yr	1		3.215	0	2.9824561	2.065818713		2.99	2.05	0.63417
Landslide	Low	1		3.393	0	0	1.131		2.99	2.05	0
	Med	1		3.393	0	0.1491228	1.180707602		2.99	2.05	0.03346
	High	1		3.393	1.283018868	0.8947368	1.85691857		2.99	2.05	0.4887
HAZMAT		5		3.193	0.320754717	1.4912281	1.668327596		2.99	2.05	1.91325
Pandemic Influenza	15%	1		1.814	0	0.4473684	0.753789474		2.99	2.05	0.05367
	25%	1		1.814	0.320754717	1.7894737	1.308076134		2.99	2.05	0.25317
	35%	1		1.814	0.962264151	3.1315789	1.969281033		2.99	2.05	0.49115


N
Camas County
Population Density
Persons per sq mile
No Population
1 - 100
101 - 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 20,000
20,001 - 387,312
0
0.25
0.5
1 Miles
0
0.3
0.6
1.2 Kilometers
Fairfield

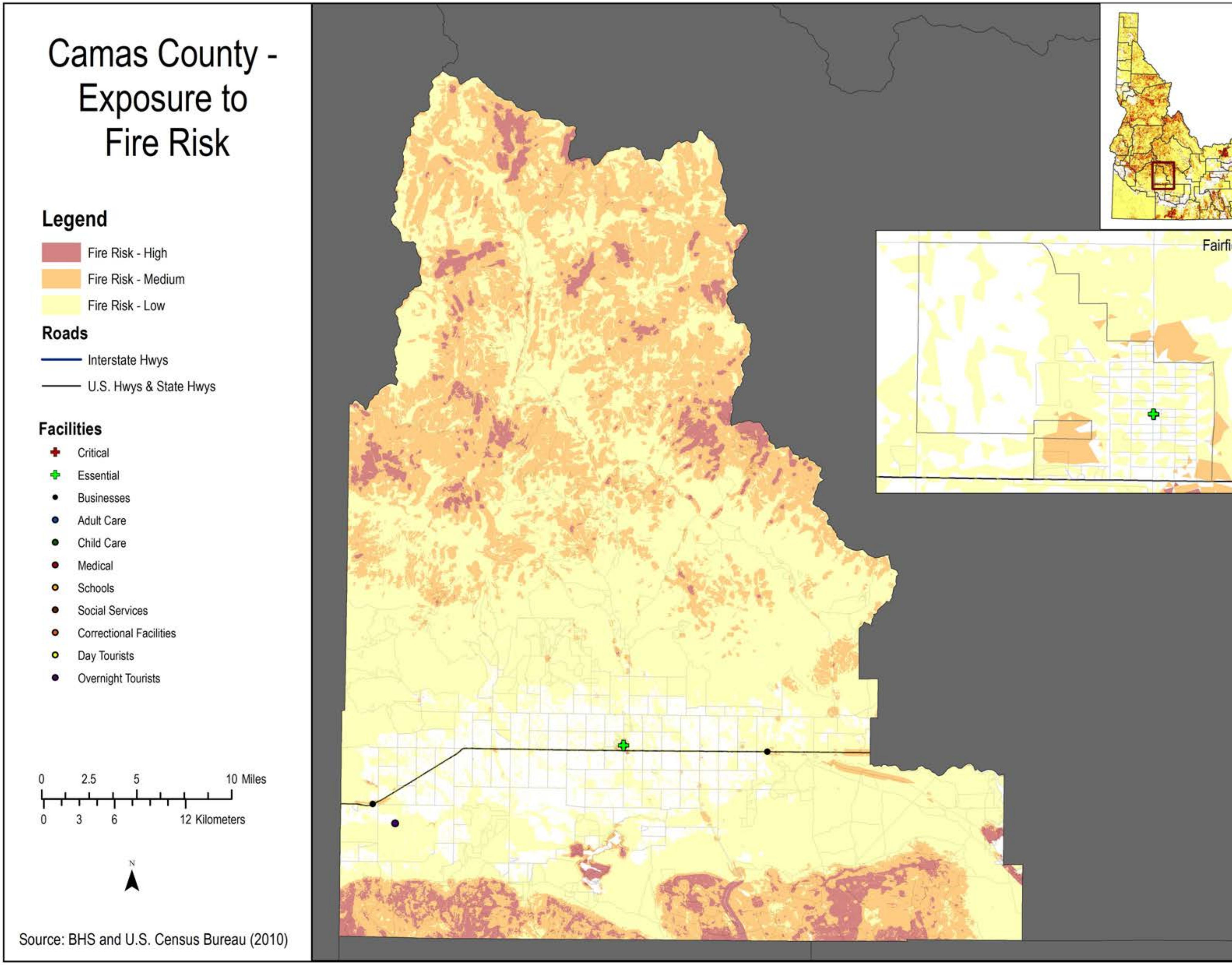


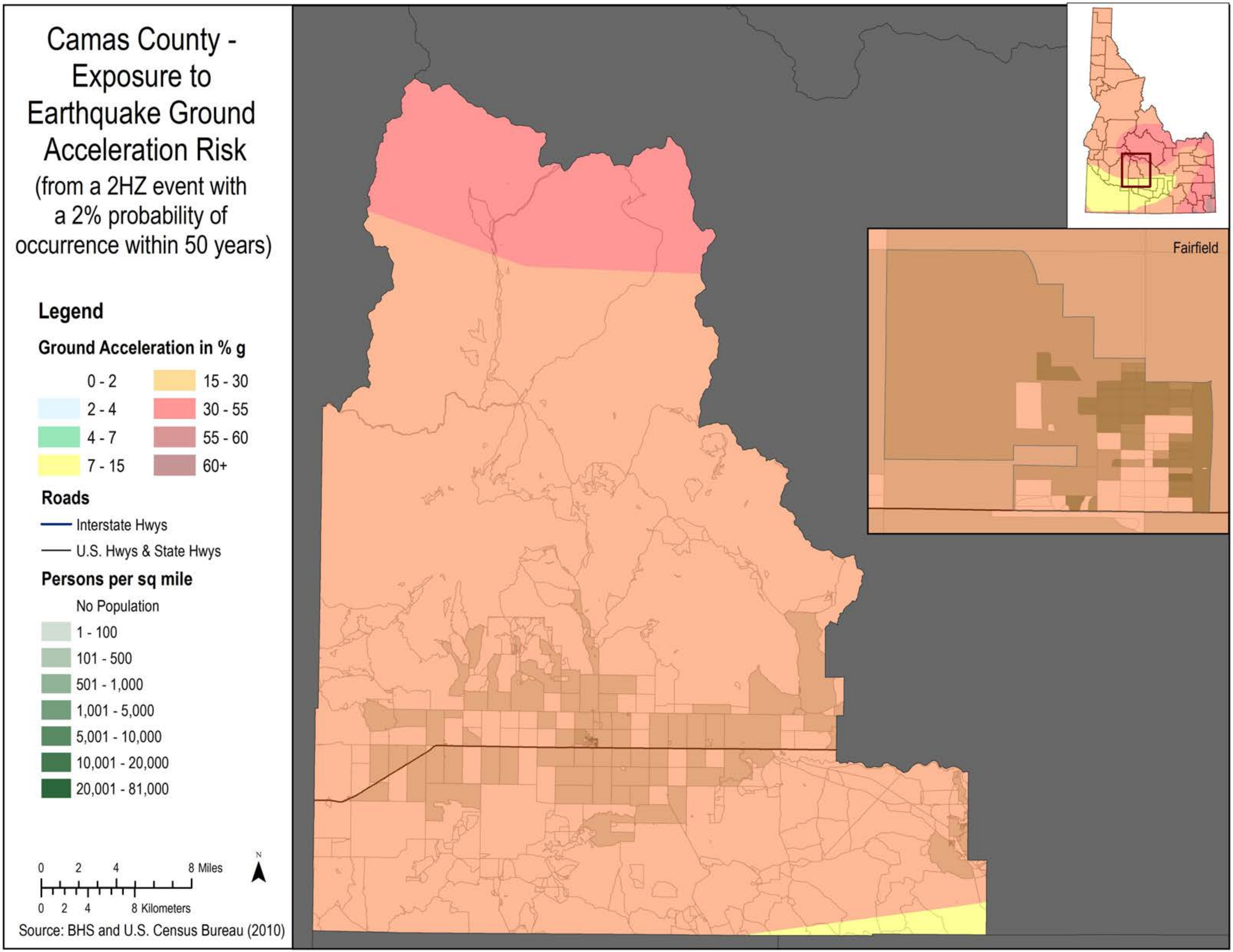
Camas County - Exposure to Flood Risk
Legend
100 year Floodplain
500 year Floodplain
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Persons per sq mile
No Population
1 - 100
101 - 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 20,000
20,001 - 81,000
0 2 4 8 Miles
0 2.5 5 10 Kilometers
N
Source: BHS and U.S. Census Bureau (2010)
Fairfield

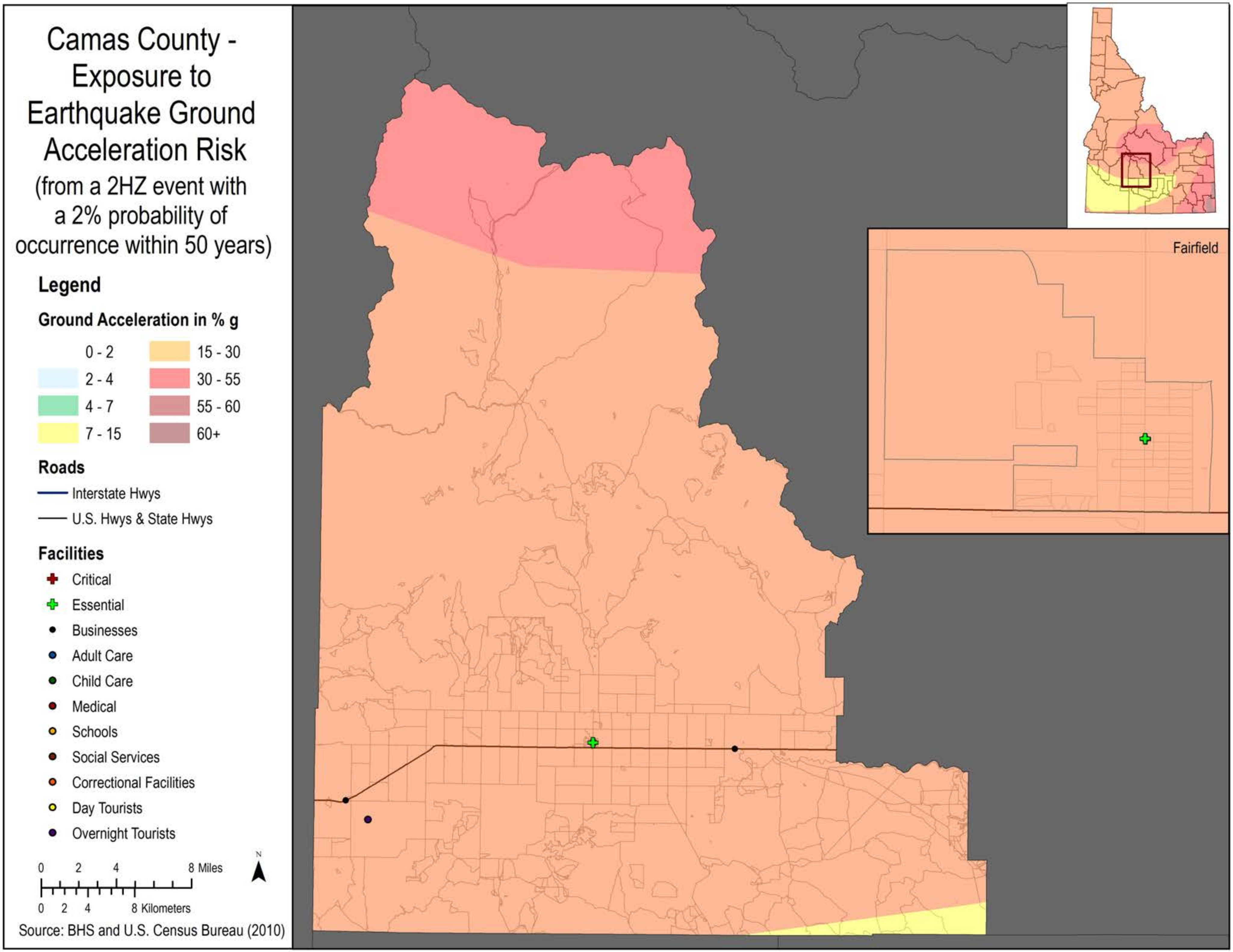

Camas County - Exposure to Flood Risk
Legend
100 year Floodplain
500 year Floodplain
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Facilities
Critical
Essential
Businesses
Adult Care
Child Care
Medical
Schools
Social Services
Correctional Facilities
Day Tourists
Overnight Tourists
0 2 4 8 Miles
0 2.5 5 10 Kilometers
N
Fairfield
Source: BHS and U.S. Census Bureau (2010)



Camas County - Exposure to Fire Risk
Legend
Fire Risk - High
Fire Risk - Medium
Fire Risk - Low
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Persons per sq mile
No Population
1 - 100
101 - 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 20,000
20,001 - 81,000
0 2.5 5 10 Miles
0 3.25 6.5 13 Kilometers
N
Source: BHS and U.S. Census Bureau (2010)
Fairfield


Camas County - Exposure to Fire Risk
Legend
Fire Risk - High
Fire Risk - Medium
Fire Risk - Low
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Facilities
Critical
Essential
Businesses
Adult Care
Child Care
Medical
Schools
Social Services
Correctional Facilities
Day Tourists
Overnight Tourists
0 2.5 5 10 Miles
0 3 6 12 Kilometers
N
Fairfield
Source: BHS and U.S. Census Bureau (2010)


Camas County - Exposure to Earthquake Ground Acceleration Risk
(from a 2HZ event with a 2% probability of occurrence within 50 years)
Legend
Ground Acceleration in % g
0 - 2
2 - 4
4 - 7
7 - 15
15 - 30
30 - 55
55 - 60
60+
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Persons per sq mile
No Population
1 - 100
101 - 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 20,000
20,001 - 81,000
0 2 4 8 Miles
0 2 4 8 Kilometers
N
Source: BHS and U.S. Census Bureau (2010)
Fairfield


Camas County - Exposure to Earthquake Ground Acceleration Risk
(from a 2HZ event with a 2% probability of occurrence within 50 years)
Legend
Ground Acceleration in % g
0 - 2
2 - 4
4 - 7
7 - 15
15 - 30
30 - 55
55 - 60
60+
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Facilities
Critical
Essential
Businesses
Adult Care
Child Care
Medical
Schools
Social Services
Correctional Facilities
Day Tourists
Overnight Tourists
0 2 4 8 Miles
0 2 4 8 Kilometers
N
Source: BHS and U.S. Census Bureau (2010)
Fairfield

Camas County - Exposure to Landslide

Legend

Landslide

- No Data
- Low (> 1.5% of area involved)
- Moderate (1.5%-15% of area involved)
- High (< 15% of area involved)
- Moderate susceptibility/low incidence
- High susceptibility/low incidence
- High susceptibility/moderate incidence

Roads

- Interstate Hwys
- U.S. Hwys & State Hwys

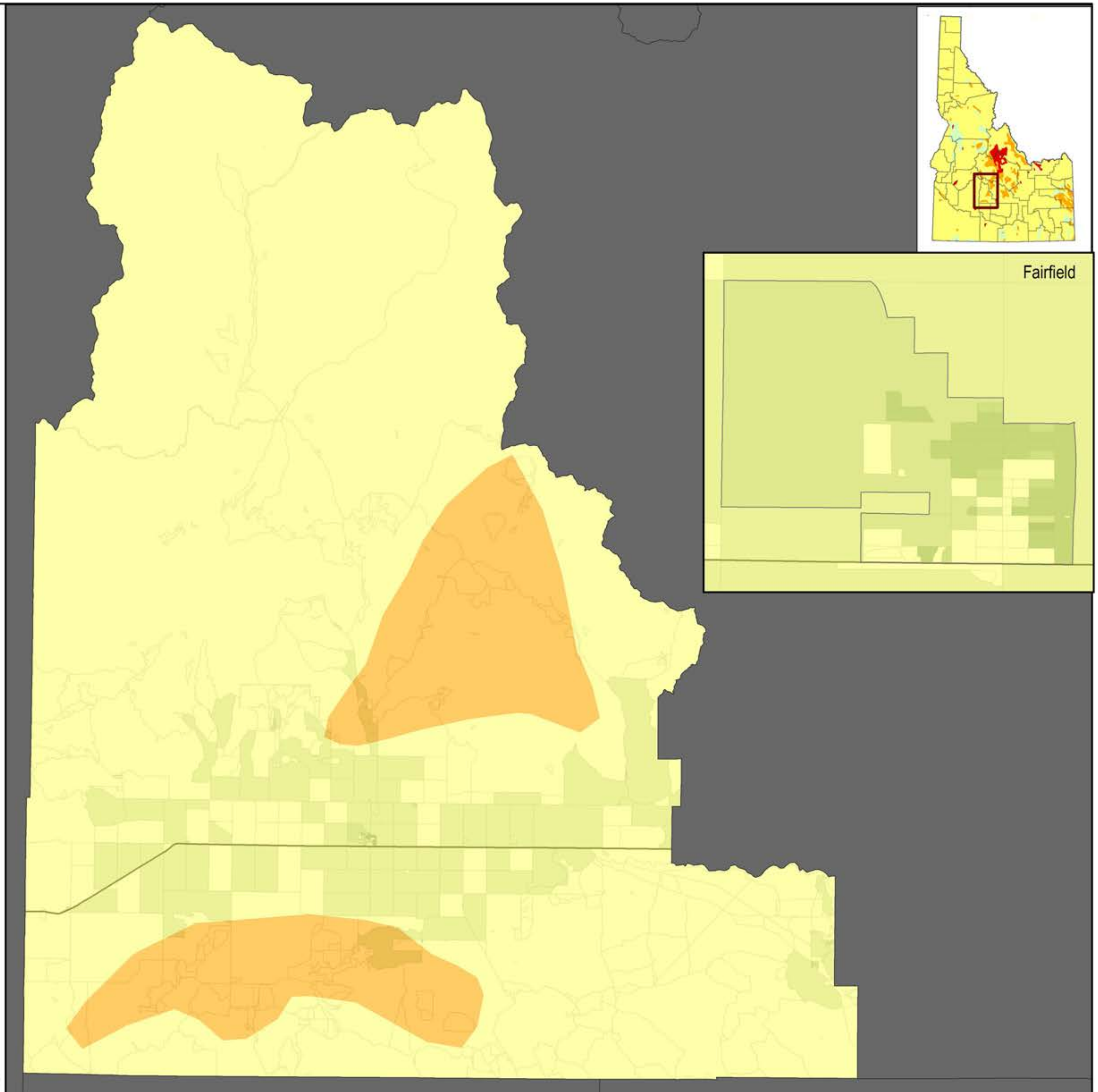
Persons per sq mile

- No Population
- 1 - 100
- 101 - 500
- 501 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- 20,001 - 81,000

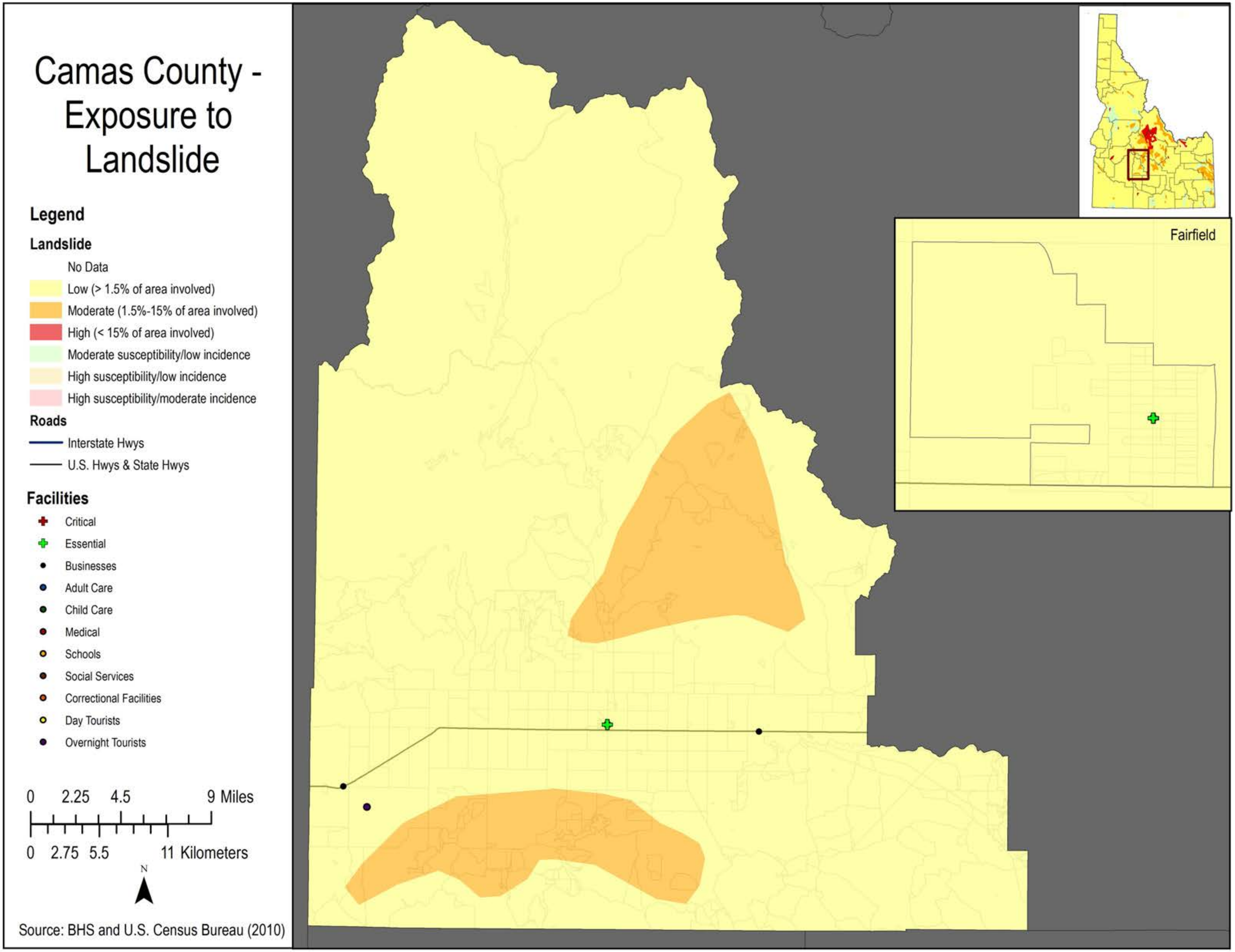
0 2.25 4.5 9 Miles

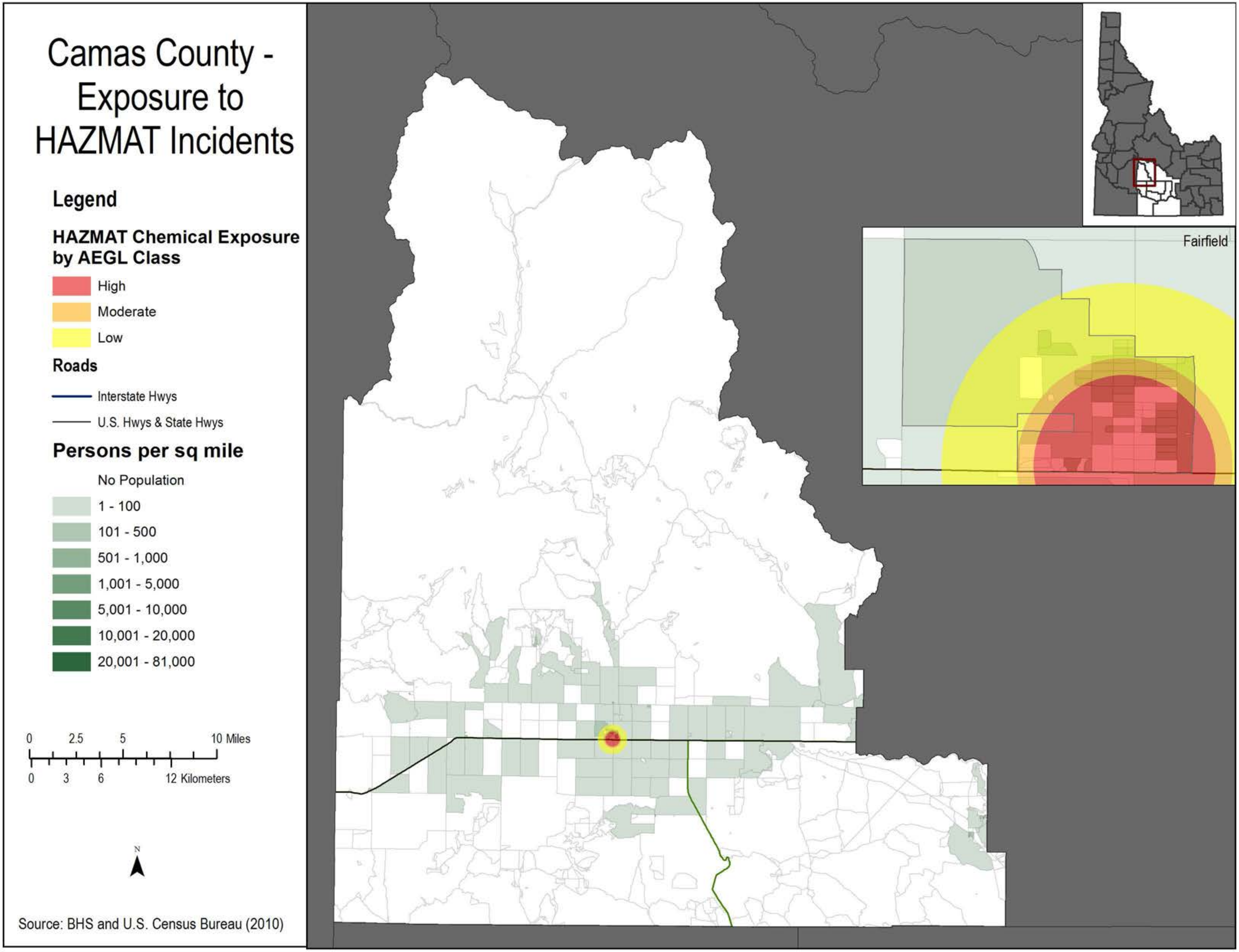
0 2.75 5.5 11 Kilometers

N



Source: BHS and U.S. Census Bureau (2010)


Camas County - Exposure to Landslide
Legend
Landslide
No Data
Low (> 1.5% of area involved)
Moderate (1.5%-15% of area involved)
High (< 15% of area involved)
Moderate susceptibility/low incidence
High susceptibility/low incidence
High susceptibility/moderate incidence
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Facilities
Critical
Essential
Businesses
Adult Care
Child Care
Medical
Schools
Social Services
Correctional Facilities
Day Tourists
Overnight Tourists
0 2.25 4.5 9 Miles
0 2.75 5.5 11 Kilometers
N
Source: BHS and U.S. Census Bureau (2010)
Fairfield


Camas County - Exposure to HAZMAT Incidents
Legend
HAZMAT Chemical Exposure by AEGL Class
High
Moderate
Low
Roads
Interstate Hwys
U.S. Hwys & State Hwys
Persons per sq mile
No Population
1 - 100
101 - 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 20,000
20,001 - 81,000
0 2.5 5 10 Miles
0 3 6 12 Kilometers
N
Source: BHS and U.S. Census Bureau (2010)
Fairfield

Camas County - Exposure to HAZMAT Incidents

Legend

HAZMAT Chemical Exposure by AEGL Class

- High
- Moderate
- Low

- Interstate
- U.S. Hwys & State

Facilities

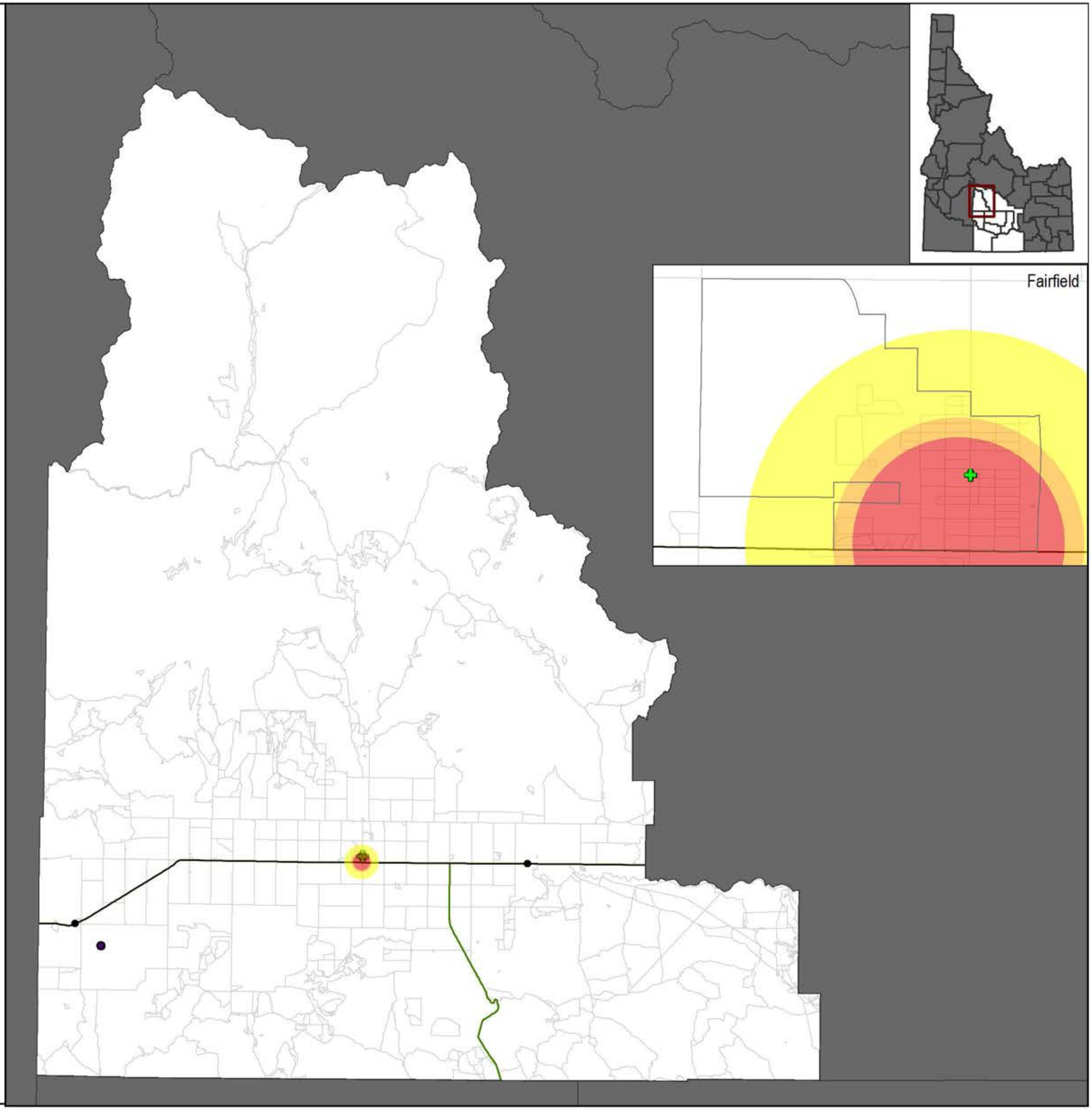
- Critical
- Essential
- Businesses
- Adult Care
- Child Care
- Medical
- Schools
- Social Services
- Correctional Facilities
- Day Tourists
- Overnight Tourists

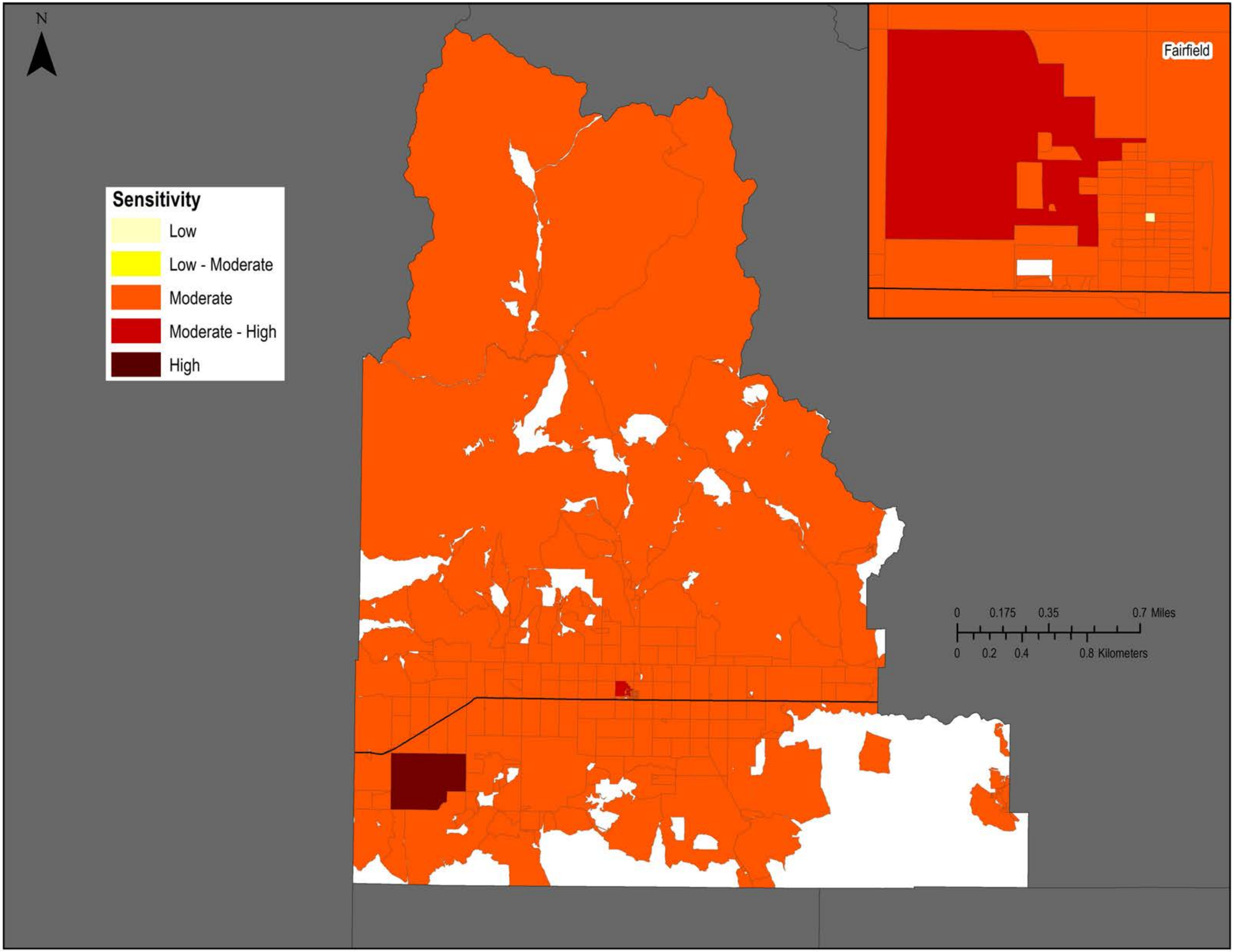
0 2.5 5 10 Miles

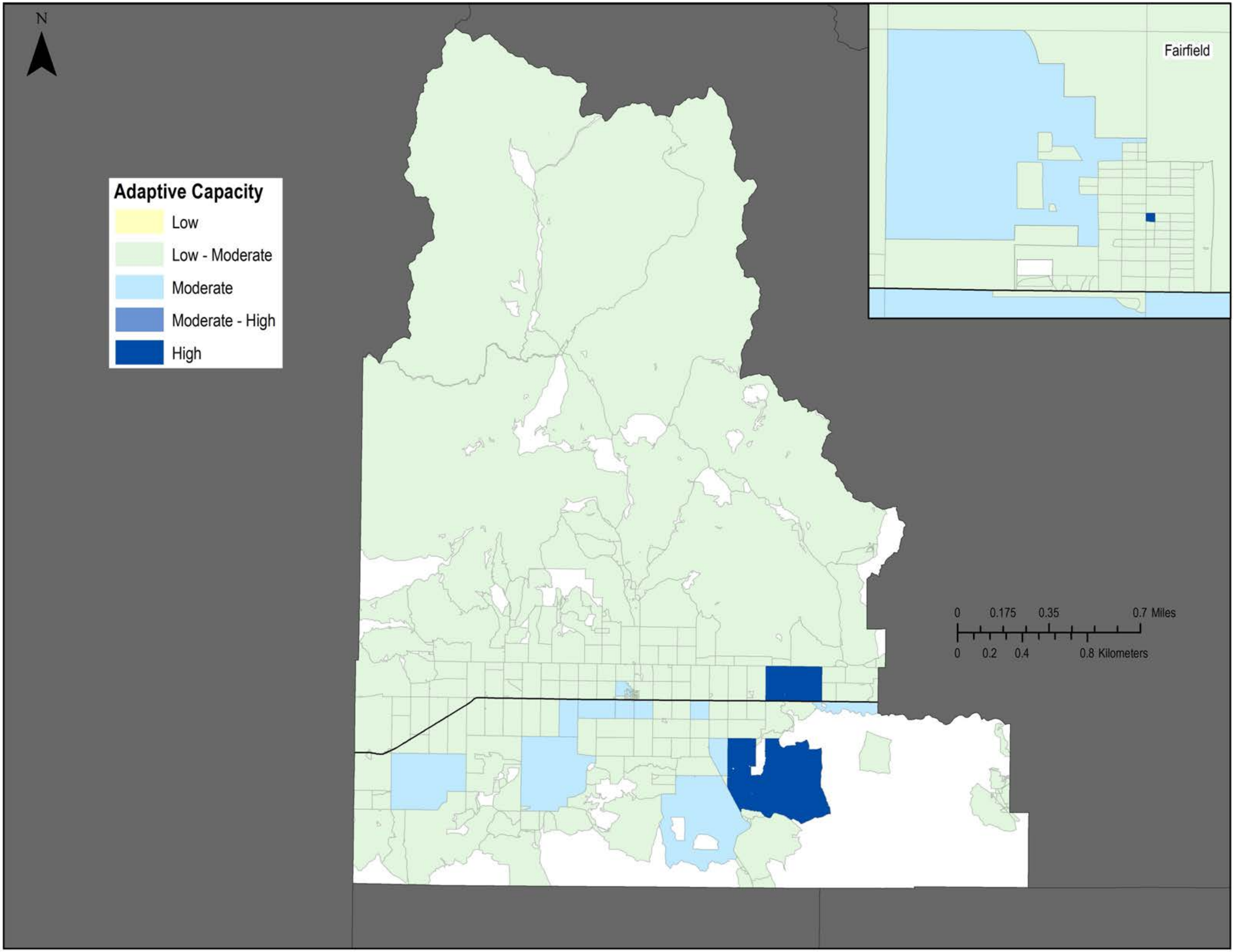
0 3 6 12 Kilometers

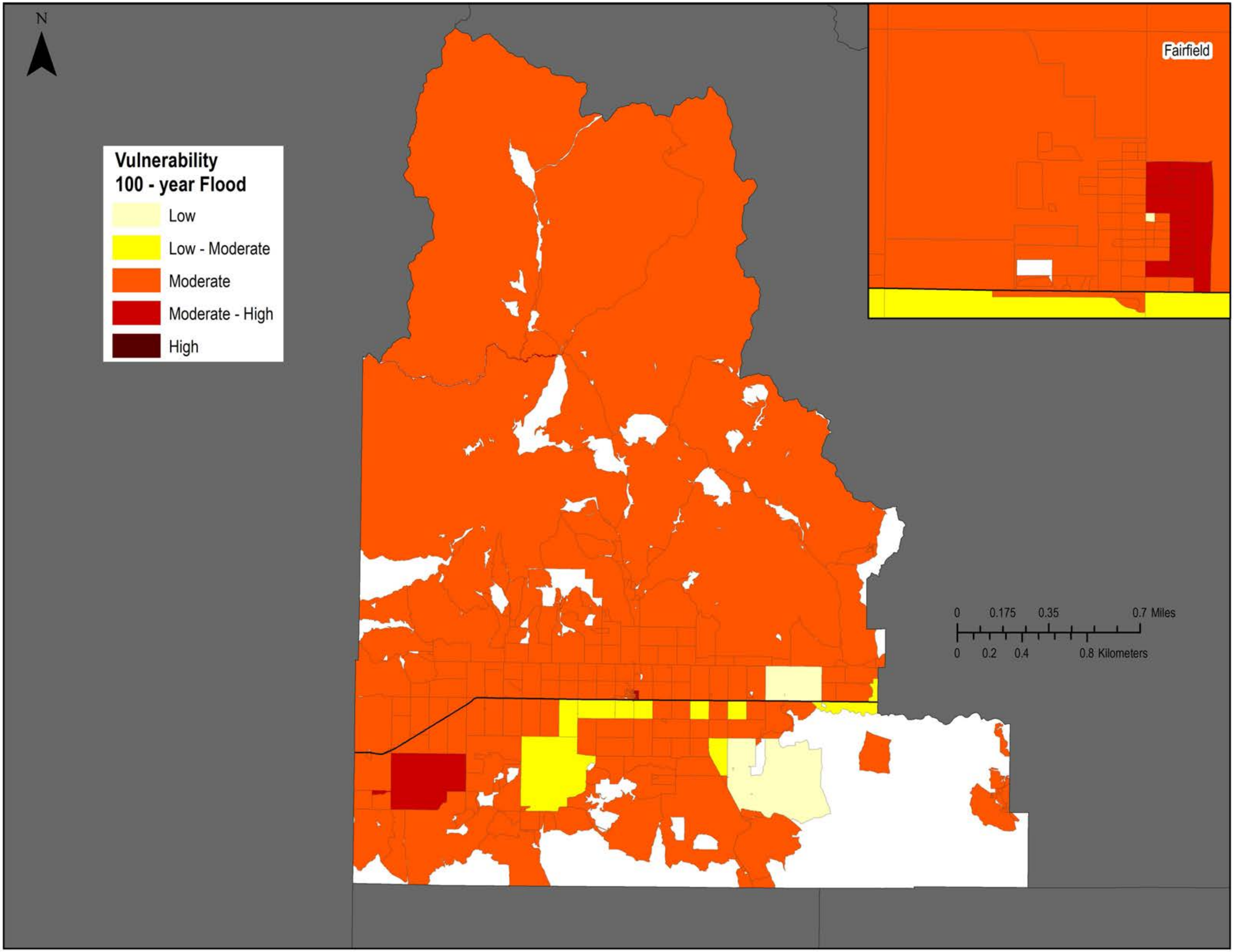
N

Source: BHS and U.S. Census Bureau (2010)

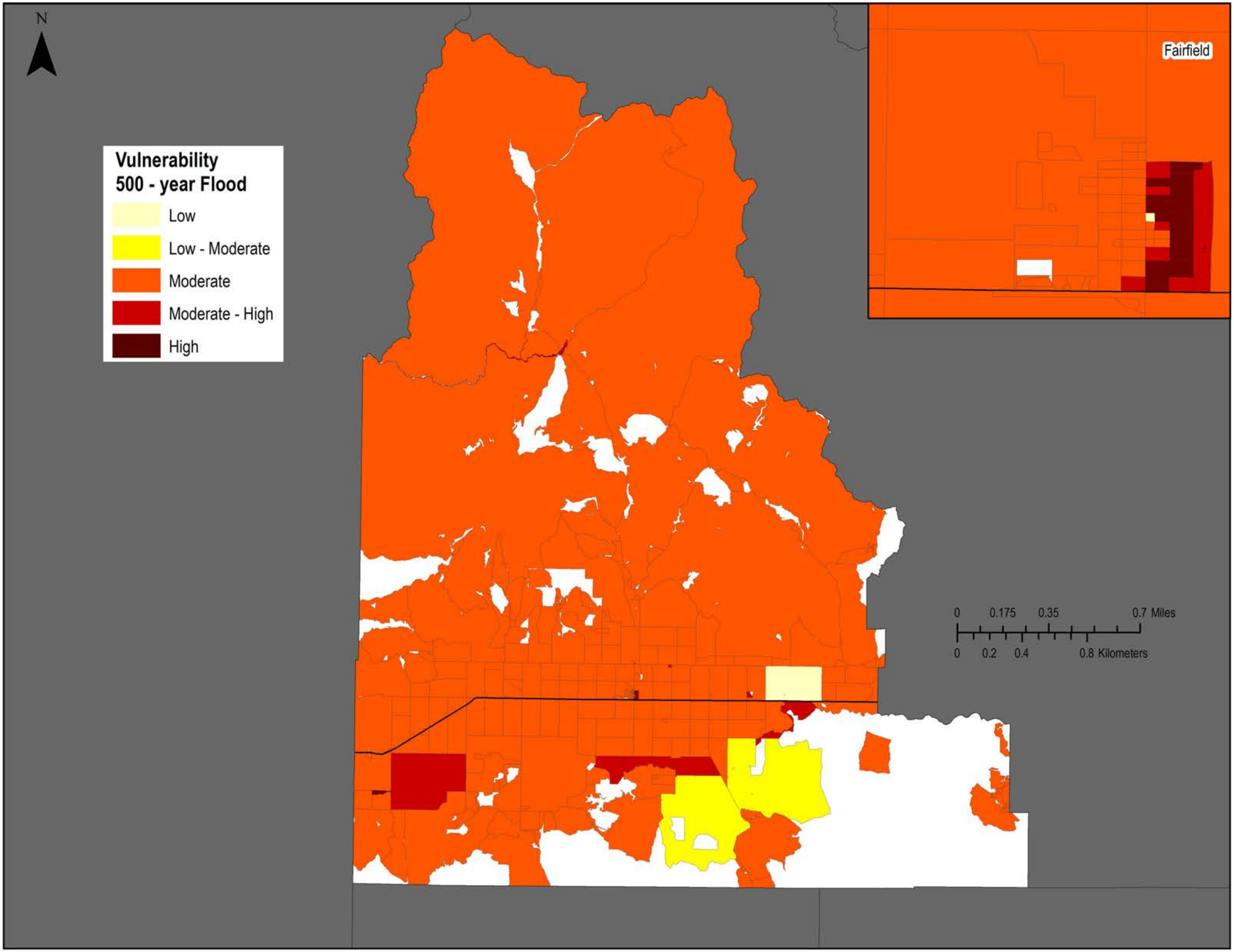


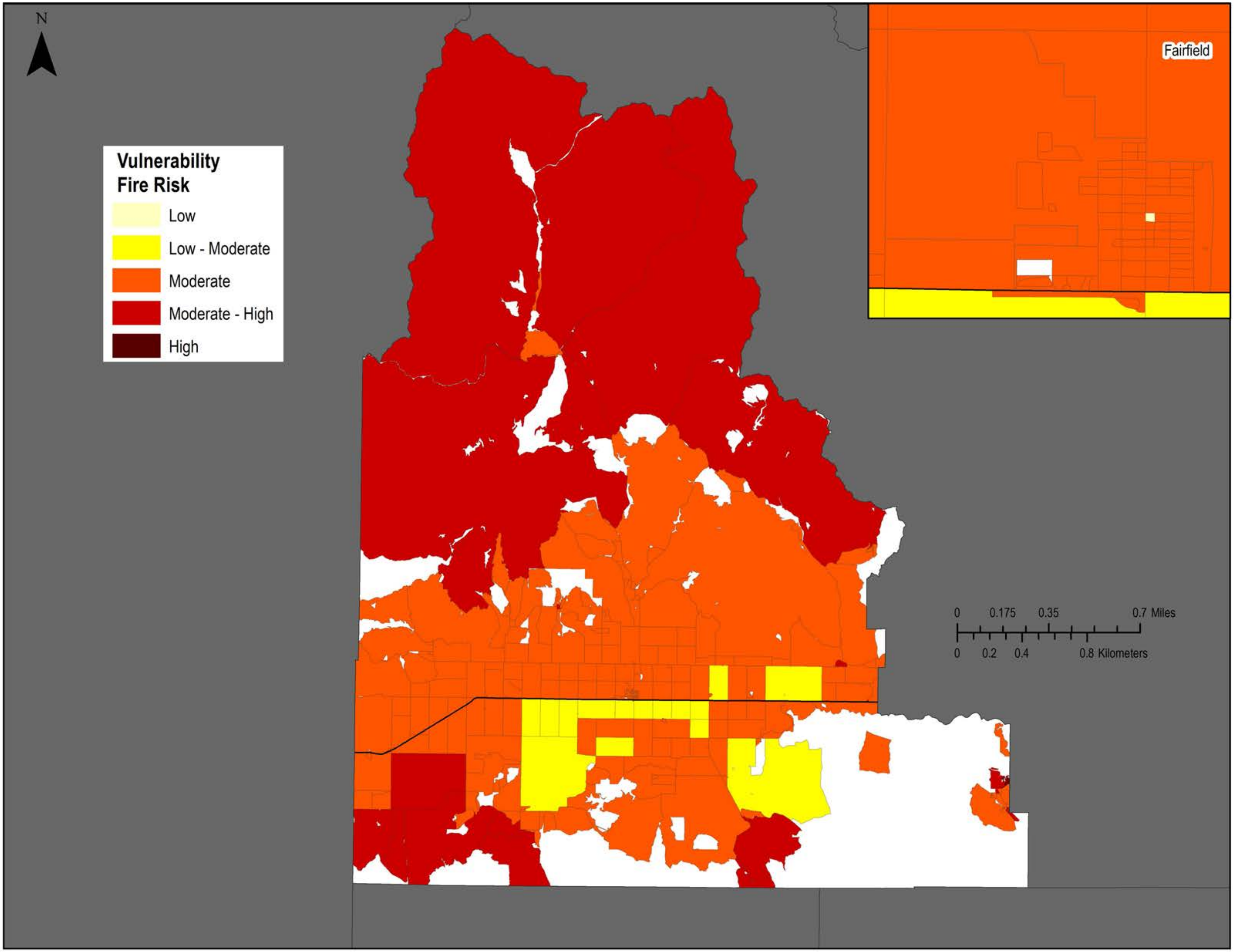

N
Sensitivity
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0
0.175
0.35
0.7 Miles
0
0.2
0.4
0.8 Kilometers

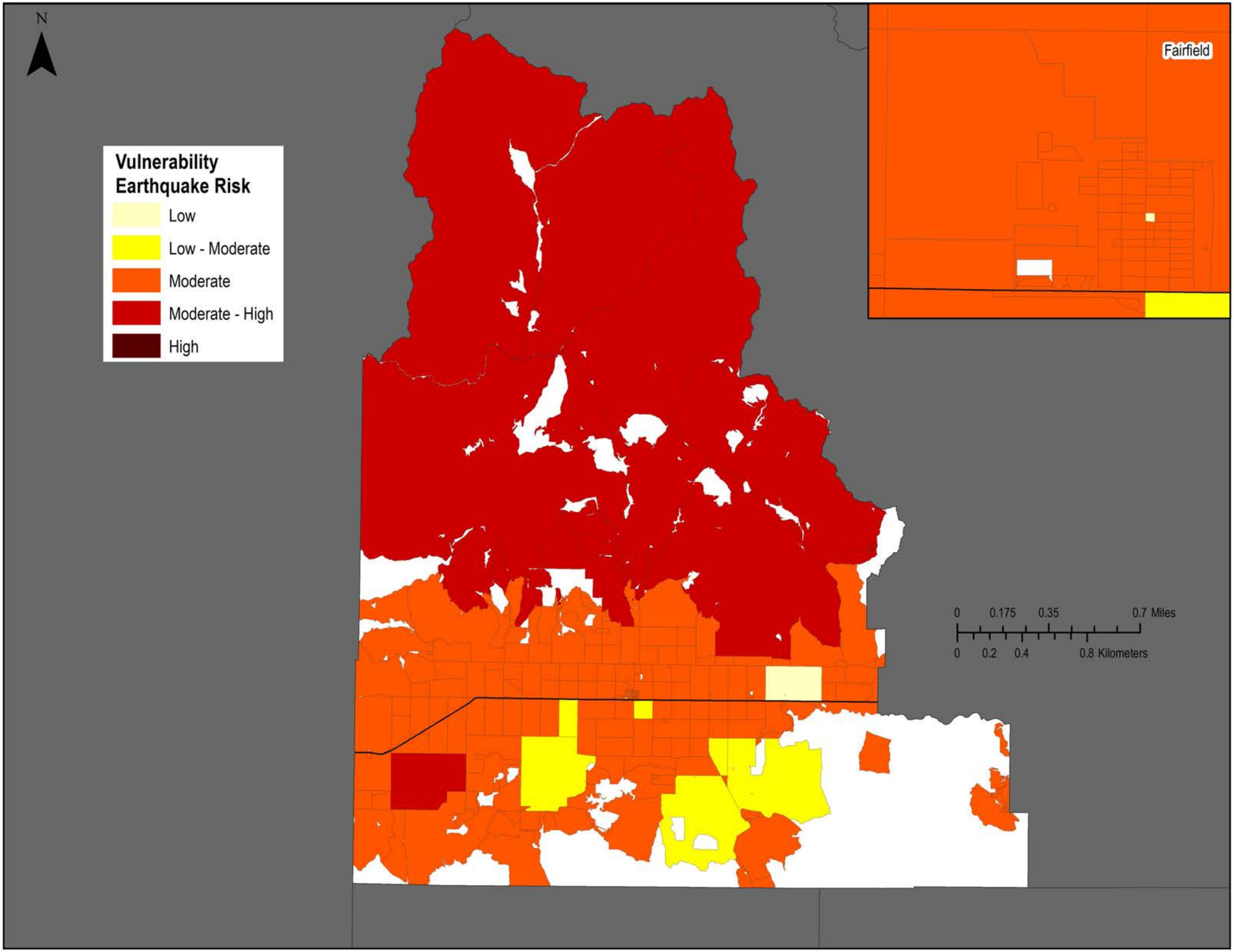

N
Adaptive Capacity
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0 0.175 0.35 0.7 Miles
0 0.2 0.4 0.8 Kilometers

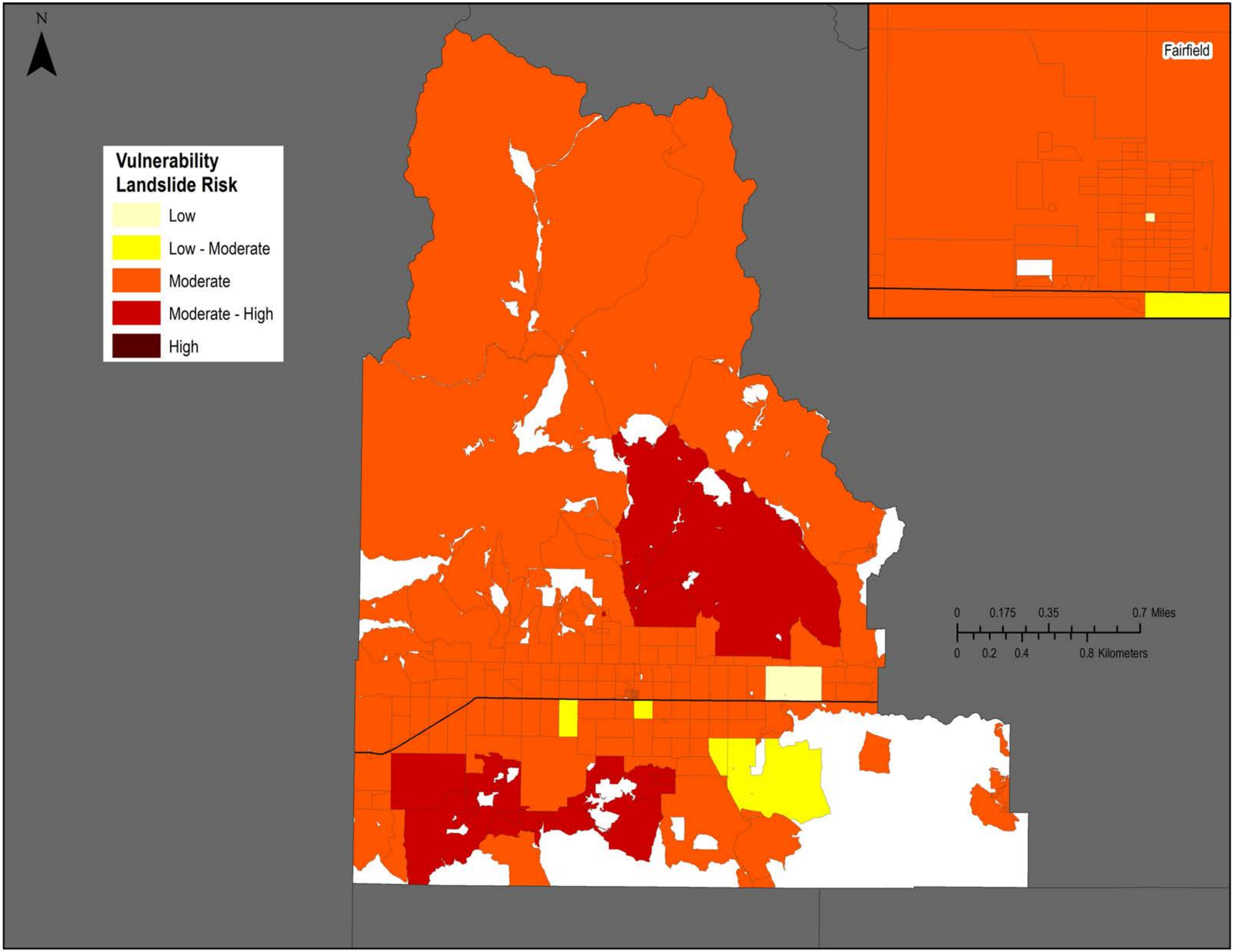


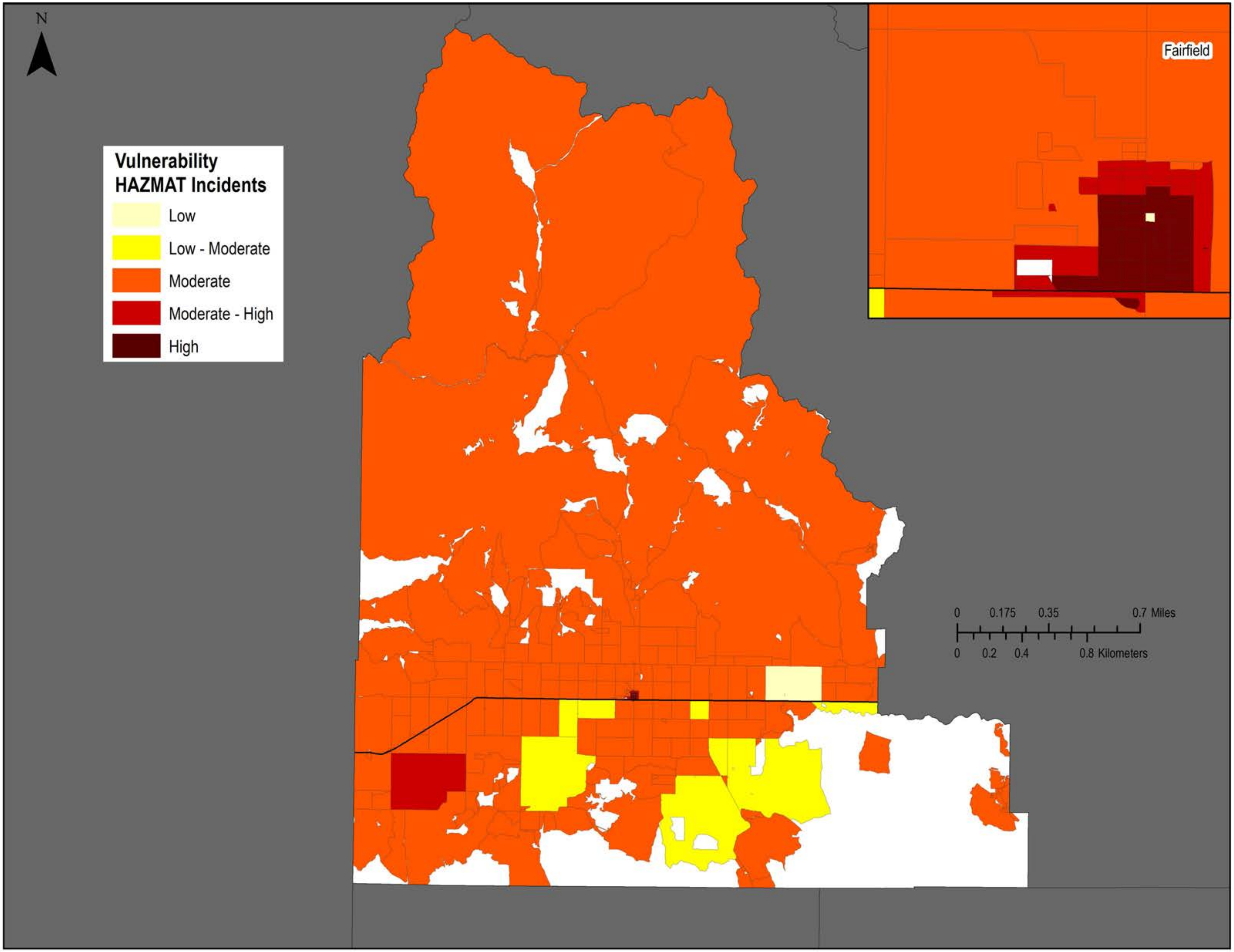
N
Vulnerability
100 - year Flood
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0 0.175 0.35 0.7 Miles
0 0.2 0.4 0.8 Kilometers


N
Vulnerability
500 - year Flood
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0 0.175 0.35 0.7 Miles
0 0.2 0.4 0.8 Kilometers


N
Vulnerability
Fire Risk
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0 0.175 0.35 0.7 Miles
0 0.2 0.4 0.8 Kilometers


N
Vulnerability
Earthquake Risk
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0
0.175
0.35
0.7 Miles
0
0.2
0.4
0.8 Kilometers


N
Vulnerability
Landslide Risk
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0 0.175 0.35 0.7 Miles
0 0.2 0.4 0.8 Kilometers


N
Vulnerability
HAZMAT Incidents
Low
Low - Moderate
Moderate
Moderate - High
High
Fairfield
0
0.175
0.35
0.7 Miles
0
0.2
0.4
0.8 Kilometers