

Research Article

Understanding the Role of Planners in Wildfire Preparedness and Mitigation

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As wildfires affect more residential areas across the United States, the need for collaboration between land managers, federal agencies, neighbours, and local governments has become more pressing especially in the context of the wildland-urban interface. Previous research has not focused much on land-use planners' role in wildfire mitigation. This paper provides information on how land-use planners can assist communities in learning to live with wildfire risk through planning, preparedness, and mitigation efforts in the wildland-urban interface (WUI). Based on interviews with land-use planners, forest planners, and local emergency management officials, we identified a range of tools that could be used for improving wildfire preparedness and mitigation initiatives in the WUI, but also found that planners felt that they lacked the regulatory authority to use these tenaciously. The paper also identifies a range of possible actions that would contribute towards safer building practices in the interface communities.

1. Introduction

Historically, land-use planning has addressed hazards like flooding, hurricanes, or earthquakes [1–3], and wildland fire risk through building codes, ordinances, and response services. With more and more people choosing to live in fire-prone wildland-urban interface (WUI) than ever before, wildfire hazards have become an important concern for land-use planning [4–7].

There is little theoretical question that proper land-use controls and site designs can mitigate (reduce) the risk of wildfire damages. Nevertheless, the fact is that in the United States, land development is not being steered away from the high wildfire hazard settings, nor are sites being adequately designed and maintained to reduce the hazards [8]. As we explore in this study, the implementation challenge lies in two areas: first, much of what planners could potentially control (development regulations, zoning, etc.) has not been defined clearly and effectively with respect to wildfire risk, and substantial residential development continues to occur in wildfire-prone areas. Secondly, managing these wildland-urban interface (WUI) areas requires significant collaboration across jurisdictional levels and geographies. For

instance, key forest management decisions for lands surrounding WUI community are typically made by national and state forest agencies, while the zoning that allows private homes is managed at county offices often many miles from the interface community, making meaningful collaboration rather challenging. Collaboration and policy coordination across jurisdictions is essential, but difficult due to the mosaic of land ownership and stakeholders involved. In addition, land use planning has not historically considered wildfires among its main concerns, so master plans may not even consider the challenges of wildfire safety in their policies.

This study explores planners' role in wildfire mitigation and how they can facilitate collaborative efforts for wildfire preparedness between the varied stakeholders in an at-risk region. Previous research has emphasized the importance of this process being conducted in partnership between communities and the governments [9–12]. Such collaboration ensures the recognition of a community's resources and adaptive capacities, which may be built upon to improve community resilience eventually leading to the success of planned reforms. This could also be useful in rebuilding communities, where preventative steps can help to minimize the risk of repetitive loss [13, 14]. Most land-use planners

and natural resource managers acknowledge the need to mandate public involvement in decision-making but face various hurdles when trying to implement it. This study identifies strategies that may enable successful community-agency collaboration in natural resource management.

There are various constraints to locally based collaboration efforts. Previous research has delved extensively into what specific constraints exist in the realm of community collaboration, namely, transaction costs, limited perspectives, organizational sustainability, policy issues and adequacy of representation, and so forth, but there is still limited research on how planners can overcome these constraints through practice and implementation [15–18]. Through key informant (KI) interviews with land-use, forest, and fire planners, this study investigates questions of multistakeholder collaboration in resource management and disaster mitigation. To understand the extent of integrating potential land-use planning with emergency management, this paper explores the perceptions and experiences of hazard and emergency planners with a focus on development in the wildland-urban interface (WUI) areas and funding for wildfire preparedness.

1.1. WUI Fire Prevention and Mitigation Measures. Current population growth and the expanding development of North America into traditionally nonurban areas have increasingly brought humans into contact with wildfires. Easy access to recreation, panoramic scenery, and lower property costs are enticing people to build homes in the wildland-urban interface or WUI [19]. WUI is defined as the area where residential structures meet or intermingle with undeveloped, fire-prone wildlands [20–24]. The WUI in the contiguous United States covers 9% of land area and contains 44.8 million housing units. WUI development is not a small or an isolated issue—39% of all new home construction in the western United States is on properties adjacent to or intermixed with the WUI, raising serious land-use planning and public policy issues [25]. At the same time, decades of fire suppression have resulted in a record abundance of fuel in and around many such developments leading to increased wildfire risk [26]. Federal agencies have recognized that collaboration at the local, state, and federal levels needs to define WUI areas and provide services, including fire protection, to developments on these lands [22].

The challenges of wildfire have received important policy responses at various levels of government. In 2000, a report recommending responses to severe, ongoing fire activity, reducing impacts of fires on rural communities and the environment, and ensuring sufficient fire-fighting resources in the future became the cornerstone of what is now known as the National Fire Plan (NFP). The interagency NFP community assistance grants provide a collaborative process for awarding funds for hazardous fuels reduction projects on nonfederal land in the WUI to reduce wildfire threats. The National Firewise Communities Program (NFPCP) is another program that advances community wildfire preparedness initiatives by forging an alliance between the WUI communities and the local agencies involved in mitigation. This approach emphasizes local community responsibility for

designing and maintaining safe communities through land-use planning, mitigation activities, collective decision-making, and effective response [27]. Additionally, a community may develop a community wildfire protection plan (CWPP) to address the challenges of the WUI, such as local fire-fighting capability, need for defensible space around homes/subdivisions, and where and how to prioritize land management on federal and nonfederal land, in a way that brings about comprehensive and locally supported solutions [28].

Communication and outreach programs are essential to help WUI residents understand natural resource issues and take appropriate actions, serving as helpful tools for creating a positive image of the agencies actively working in the interface areas [29], and provide planners and other officials an opportunity to learn about residents' concerns and questions as well as work collaboratively to help resolve interface issues [30]. The outreach efforts gain even more significance in the context of fuel-hazard planning or treatments such as prescribed burning or major forest thinning projects on public lands, where residents familiar with these techniques tend to support them more strongly [31, 32].

1.2. Land-Use Planning and Wildfire Hazards. While many of the policies affecting the WUI are federal, land-use planning in these areas remains in the local or county jurisdiction. Most WUI-related research to date has focused on planner's role in general subdivision layout/planning and growth management especially with regard to sprawl, smart growth, and transportation; while others have looked at disaster management with respect to flood and earthquake preparedness, and rehabilitation [33–37]. However, research on wildfire awareness/mitigation techniques and regional planning initiatives in WUI communities is in more initial stages [6, 38, 39].

Efforts to site future growth and development in areas which avoid natural hazards will minimize risk to life and property [19]. Research indicates that by establishing clear growth management goals, policies and implementation strategies within the context of wildfire hazard mitigation, communities can reduce the potential dangers from wildfire [8, 40]. Implementation strategies may range from advisory recommendations for construction and site design, to regulatory controls including zoning, land division and other ordinances, building codes, subdivision controls, design standards, road and signage standards, and others [8, 21, 41]. Additionally, regulatory programs that utilize jurisdictional legal authority to develop and implement regulations to protect health, welfare, and safety can also be effective tools for reducing the threat of wildfire and the resulting damage to property as a result of fire. Most hazard mitigation initiatives involve some element of land-use or other planning activities, such as community and economic development, transportation, or historic preservation [40]. For example, requirements for setbacks, landscaping, road widening, egress routes for evacuation and fire truck access, and so forth can assist in reducing fire hazard. In addition, establishing appropriate densities relative to slope is often essential in mitigating landslide hazards [42, 43]. Other land-use related wildfire management efforts include ensuring adequate water systems, sufficiently wide streets, clear and

consistent street signage, and maintenance of perimeter green belts [12, 44].

A significant challenge at the site level is that it is not enough to just build the property right the first time—risk prevention requires that landowners be willing to accept a high degree of responsibility for protecting their homes from wildfire, and undertake periodic vegetative clearing efforts [45]. Thus, effective mitigation cannot occur only at the planning stage, but also needs on-going inspections and maintenance. Community protection zones (CPZ) can be an effective response to this by minimizing wildfire threat through appropriate hazardous fuels reduction measures within a zone surrounding the WUI communities, thereby making a community wildfire prepared [46]. The success of community preparedness efforts depends on community members not only being stewards of their land, but coming together for the common good, coming together as a community [47, 48].

Despite the accessibility to several risk reduction measures, focused land-use-based management of the WUI to limit fire hazard is uncommon, both at the community and individual site levels perhaps due to people's risk perceptions and their willingness to engage in risk mitigation strategies [49]. In some cases, forest and wildfire plans are the exclusive domain of resource and emergency managers while in others, planners may not yet have asserted a role in hazard planning, often due to lack of adequate familiarity with the subject [50, 51]. Limited or no involvement of planners in hazard mitigation plans due to a disconnect between planning and other resource/hazard management agencies is one of the major hurdles in implementing risk reduction measures at the outset of a development [29, 52]. Additionally, lack of previous direct fire experience, subjective knowledge, and risk perceptions regarding the fire-prone ecosystem on the part of property owners and local officials may result in inadequate tradeoffs between risks and benefits of alternative land-uses or planning policies [11, 53, 54].

The WUI has certain unique attributes that affect the way it fits into the planning process. The most obvious is that the WUI is not primarily a problem affecting the urban core but one affecting the management of growth [18]. Given the geographic considerations, it may be possible for planners to identify those land-use practices that will help to facilitate wildfire safety [55]. The most powerful legal rationale for land-use regulation undoubtedly is public safety, and fire protection of any kind inherently implicates safety concerns. The concern primarily is one of putting enough regulatory authority and decision-making power in the hands of planners to enable them to establish the efficacy of particular actions to address the problem [5]. One of the reasons for limited research on the role of land-use planning in wildfire mitigation is that fire preparedness lies at the nexus of federal and local authority, and between rather different professional training for land-use planner, natural resource manager, emergency management professional, and so forth. Unfortunately, the actions of each professional affect the other, while greatly influencing the future residents of the WUI.

An "all hazard mitigation plan" may play an important role in overcoming the challenges of tying hazard mitigation

into daily planning activities. Authorized under the Disaster Mitigation Act of 2000, it emphasizes the need for state, tribal and local entities to closely coordinate mitigation planning and implementation efforts. In addition, the Act continues the requirement for a state-level all hazard mitigation plan as a condition of disaster assistance, and creates incentives for increased coordination and integration of mitigation activities. These plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage [56]. The planning process is as important as the plan itself: it creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters [57].

Much of the problem is that few convincing ties have been made between land-use planning and wildfire mitigation. Current practices at the agency level are limited in scope and seldom reflect such a synthesis, and this may be one of the reasons why hazard awareness is absent from the local planning processes. This is where this research will attempt to make a meaningful contribution by identifying areas where land-use planning can intervene and integrate with wildfire preparedness and mitigation efforts. A substantial area of inquiry in this paper is the manner in which land-use planning tools may be used effectively to make residents better equipped for preventing or battling wildfires, and ensure safer development practices in the WUI communities.

2. Methodology

In this study, qualitative research methods were employed to explore the perceptions of agency personnel regarding wildfire preparedness and mitigation policy as well as ascertain their willingness to collaborate, particularly on issues of shared concern in WUI communities. Findings were used to examine land-use regulations and identify factors that might promote community preparedness and interagency collaboration for wildfire mitigation.

Considering the comparative novelty of the research topic, it was essential to identify and investigate the inherent themes that were directly or indirectly related to affecting planning decisions regarding development in the WUI. We employed semistructured, open-ended key informant (KI) interviews to encourage an in-depth discussion of the role of land-use planners, forest and emergency management officials in wildfire preparedness especially with regard to the constraints and impediments of planning in the WUI; comprehensive planning initiatives; knowledge of community residents and visitors regarding mitigation strategies. Questions also sought information on participants' view of current wildfire legislations and policies, role of National Fire Plan funding in furthering community preparedness initiatives, regulatory limitations of developing in the wildland-urban interface, and potential collaborative opportunities to ensure the longevity of mitigation efforts. The authors intend these findings to be useful to government agencies across jurisdictions in integrating land-use planning tools in wildfire mitigation as well as developing and improving inter-agency networks to ensure safe building practices in the WUI.

Six communities were selected based upon the variation in their geographical location, previous wildfires and proximity to the WUI, community-agency engagement, community assistance programs through the National Fire Plan (NFP) funding, and education and outreach initiatives. Since a diverse geographic sample was desired, the communities were distributed according to the US Forest Service regions across the nation. Combining these selection factors led to the following study set: Northern region (Region 1)—Red Lodge, Montana; Rocky Mountain region (Region 2)—Glenwood Springs, Colorado; Southwestern region (Region 3)—Ruidoso, New Mexico; Pacific Southwest region (Region 5)—Grizzly Flats, California; Southern region (Region 8)—North Port, Florida; the Eastern region (Region 9)—Berkeley Township, New Jersey. All case study communities were in close proximity to national and state forests, and were a major recreational destination for both year-round and seasonal residents, with the exception of Grizzly Flats, California. Other criteria for selection included previous wildfires and proximity to the WUI, NFP funding, and types of fire preparedness initiatives (see Table 1).

Key informant interviews involve identifying different members in a community who are especially knowledgeable about a topic (in our case, wildfire preparedness), and asking them questions about their experiences working or living within a WUI community. Our key informants (KI) comprised of a purposive sample of the main stakeholder agencies involved in wildfire mitigation. For each site, we interviewed the land-use planner responsible for the WUI area, the Forest Service or other federal/state planner responsible for the wildlands, and the emergency management official, resulting in a sample of 20 publicly and privately employed planners, foresters, and fire officials. This allowed us to triangulate the findings of varied agency officials [58], and compare perspectives regarding wildfire preparedness, mitigation strategies as well as fire management policy across those responsible for managing the development and safety of WUI communities. Purposive sampling was used to make contacts within all agencies, and in-depth telephone interviews (ranging from 50 minutes to 2 hours) were conducted with these officials. Interviews were recorded, reviewed, and summarized, with key quotes transcribed verbatim [59]. The interview responses were then compared across each research question for similarities and differences in participants' responses, and for underlying and emergent themes [60, 61].

The interviews were conducted in the fall of 2008 through spring of 2009. The research was part of a larger study utilizing survey data and extensive quantitative analysis (redacted). For the KI interviews, the following quotes are anonymous and were selected as the most comprehensive and coherent representations of broadly held opinions.

3. Results

This section discusses the following six themes that emerged from the qualitative data: (1) constraints and impediments to land-use planning in the context of building regulations and subdivision layout in WUI communities; (2) collaborative planning to involve all concerned agencies in sharing

expertise and resources; (3) implementing comprehensive planning by linking land-use planning with resource management and hazard mitigation; (4) the implications of National Fire Plan funding; (5) other outside influences (insurance) and their role in improving wildfire preparedness.

3.1. Constraints and Impediments to Planning in the WUI.

Across the sample, there was widespread consensus that land-use patterns, practices, and changes in fuel conditions (thinning, removal of understory, etc.) were among the most important factors influencing the dynamics of fire regimes across the study areas. Both emergency and land-use planners (72% of the interviewees) advocated stricter regulatory requirements for building in the WUI, and were of the opinion that building codes needed major overhauling since most of them were outdated, and not really accustomed to the landscape of the study regions. A typical comment was:

Ruidoso KI: "The ordinance for Ruidoso was adopted more than twenty years back and I feel that many are flatland standards. They simply do not fit the mountain standards and what building needs this unique environ might have. It's just a cookie cutter approach and does not address many of the basic issues which are very critical from a wildfire safety point of view."

Land use planners' perspectives were remarkably similar as they emphasized the development of compact communities in the WUI:

Grizzly Flats KI: "I think that we need to get away from such a broadly dispersed housing base...there is sort of an attitude that anyone with a piece of property has the right to develop it, but there are some areas that are just not as suitable for development. We really need to start thinking about the land-use pattern...that would also help against wildfires by not having as many homes on the hinterland [WUI]."

Planners noted a range of challenges to achieving this, however. Limited developable land base often resulted in greater pressure to develop on areas that might be unsuitable for development; especially in the absence of any no-building zones, permit restrictions, or development ordinances, as well as private property rights that served as an important constraint in controlling or regulating development in the vulnerable WUI areas. They also reported a lack of substantive data on fire conditions and mitigation options due to the absence of inter-agency interactions, which made it more difficult for them to take action.

Along with restrictions in regulatory authority, most officials (about 94%) also pointed to the lack of financial resources to support fire prevention as a major stumbling block for conducting on-the-ground wildfire mitigation.

Glenwood Springs KI: "We need to have more codified authority. We have not adopted the wildland urban interface codes here... we kind

TABLE 1: Case study communities' selection matrix.

| State | Community | Last fire | Area affected (acres) | NFP funds | Popu. | Nearby NF/SF/NP | Type of fire preparedness |
|------------------------------------|-------------------|---|--|-----------------------|-------|-------------------|--|
| Region 1: Northern Region | | | | | | | |
| MT | Red Lodge | 2000—Willie fire | 1,500 | Yes | 2,449 | Yellowstone NP | Ranch residents apply for NFP grants FS designed hazardous fuel reduction project/demonstration fuel break Creation of subdivision regulations to increase fire safety |
| Region 2: Rocky Mountain Region | | | | | | | |
| CO | Glenwood Springs | 2002—Coal Seam fire 1994—South Canyon fire | 12,209 2,115 | Yes | 8,942 | White River NF | Creation of Glenwood Springs Fire Protection District and the CWPP Thinning/prescribed burning projects Identifying and preplanning primary escape routes Educating residents about ignition-resistant construction and proper evacuation centers |
| Region 3: Southwestern Region | | | | | | | |
| NM | Ruidoso | 2000, 2001, 2002 | 6,500 (Cree fire) 463 (Trap/Skeet fire), 1,000 (Kokopelli fire) | Yes \$942,699—FY 2002 | 8,899 | Lincoln NF | Village-wide hazardous fuels reduction program, ordinances, and building codes Education/outreach, one-on-one meetings, Neighborhood Fire Watch, reverse 911 dialing system/event-driven strategies |
| Region 5: Pacific Southwest Region | | | | | | | |
| CA | Grizzly Flats | 1910 | — | Yes (\$500,00) | 647 | El Dorado NF | Creation of defensible space by homeowners Fuel reduction along evacuation routes FireSafe planning—new subdivisions and parcel splits |
| Region 8: Southern region | | | | | | | |
| FL | North Port | 2003 2000 | 6,000 1,800 Flowers Myakka Fire Complex | Yes | 54308 | Myakka SF | Creation of defensible space Access roads and water to all the subdivisions Educating homeowners about wildfire mitigation measures and evacuation plans 1992—prescribed burning program, 1200 acres/year burnt under this program. |
| Region 9: Eastern Region | | | | | | | |
| NJ | Berkeley Township | 1997 2002 | 702 Wrangle Brook fire 1,277 Jake Branch fire | Yes | 42664 | Double Trouble SP | FireSafe committee-education/outreach; talk to local school groups/HOAs about wildfire preparedness Management of fuel loads |

Note: NFP: National Fire Plan; SF: State Forest; NF: National Forest; NP: National Park.

of use them but they do not have the power of law. I think that more regulatory requirements would be good. . . I would certainly also like more dollars made available from municipal, county, state, federal sources to actually do more on-the-ground wildfire mitigation. . . more fire breaks, more thinning—those types of things to make individual properties safer.”

3.2. Collaborative Planning in the WUI. With regard to the planners’ role in wildfire mitigation and development in the WUI, most land-use planners (30% of those interviewed) saw their roles as facilitating communication between all interested stakeholders; coordinating actions to help minimize loss of life or property from future wildfires, and working with other agencies in effective partnerships. Planners also stressed that their approach was comprehensive as they focused on several issues, namely, circulation, development patterns, and housing density instead of just suppression.

Grizzly Flats KI: “For the most part, the forest service, CALFIRE, fire agencies. . . their main focus tend [sic] to be on suppression, whereas the planner has to be more of a generalist. We are looking at the impact of housing and the potential for wildfires and other natural disasters; we’re also looking at circulation issues, public services-jobs-housing balance, new growth patterns, and so forth. . . so we have the ability to look at the bigger picture! I think that we’re mediators/advisors to the decision-makers; as a public sector planner, we have [sic] a responsibility to give our best professional advice even though it sometimes goes against the general philosophy of the elected officials; but we should continue to make recommendations even though they may not be popular. We are often seen as moderators between the debates of people who want to develop and those who do not want any development to occur.”

Planners in the case study areas regarded local planning offices as clearinghouses for public agencies and as conduits for public input regarding development initiatives in the WUI. By disseminating information collected from planning and other agencies, and bringing together various stakeholders, planners felt that they might enable coordination at the regional level. However, fixed agency goals and the absence of active inter-agency dialogues prevented meaningful discourse about collaborating on wildfire mitigation issues.

Berkeley Township KI: “I think that planners have a more regional perspective and there’s a clear understanding of the different roles that various parties can play. . . I think the planner can act as a facilitator in bringing those parties together. We have the access to all the data to map and illustrate implications of the development in the WUI, the ability to demonstrate

high hazard areas, and to explain the relationship between the WUI and that boundary between the forested and developed areas. Moreover, from the environmental planning position, we have the ability to explain the need for bioregimes and what they mean for developed areas as well.”

A shared perspective among the three groups was that the interdisciplinary potential of forest, land-use, and emergency planning should be harnessed to facilitate skills and knowledge exchange to overcome the challenges of jurisdictions and regulatory authority. Approximately 97% of the interviewees were of the opinion that collaboration in the context of wildfire mitigation was essential due to multiple stakeholder involvement and agencies needed to work together as the regulation of public lands and private property varied greatly. Study participants also stressed that sharing resources and services—personnel, equipment, and so forth strengthened inter-agency networks.

Berkeley Township KI: “[Collaboration] definitely helps because it brings together all the people that need to be involved and ultimately that becomes cohesive. . . volunteer fire agencies, emergency response people, communities and that overall improves the effectiveness of any kind of emergency response and there is better understanding and communication.”

North Port KI: “If a wildfire would break out in an area of our city and we needed help, the neighboring city/county would send their crews over to help us and vice versa if it happens to them, we’d send our guys over there. . . we do help each other, we try to have close relationships there so that you have exchange of services.”

3.3. Implementation Issues: Comprehensive Planning and Hazard Mitigation. Addressing wildfire in the planning process is not an easy or obvious task given current planning practices. Interviewees (about 68%) stressed the need to link land-use planning with hazard mitigation and resource management to enable development of collaborative partnerships across local, state, and federal governments, ensuring safer and smarter patterns of development in the WUI. Several planners made direct reference to the American Planning Association’s (APA) Growing Smart project’s recommendations regarding creating an “all hazards mitigation plan,” which they felt should be incorporated into the regular master planning process, forging effective alliances with various departments to build upon and strengthen their region’s natural hazards risk and loss reduction efforts. Planners argued that hazard mitigation plans should focus investment not only on personnel, but also on site planning and development as the effects would be more lasting once funds were depleted. In addition, planners felt that there should be strict adherence to fire safety standards for building and residing in the WUI.

Glenwood Springs KI: “I think the most important thing that planners can do is assure that there are good standards and then we’re making good decisions both from a planning context and actual day-to-day construction perspective. . . and so we’re not creating hazards as we go and another big thing we can do is to keep reminding people that this is and will continue to be an issue over time.”

3.4. Implications of the National Fire Plan Funding. The National Fire Plan (NFP) is a potentially important element in assuring the protection of lives and property from wildland fire and assuring the long-term viability of the forest resources as well as expression of priorities for wildland fire management. Surprisingly, almost 82% of all personnel interviewed were not aware of the NFP as an important funding source for community assistance grants, especially with regard to the cost-share program for hazardous fuel reduction. A probable reason could be the ambiguity surrounding its distribution from the federal to the local level through various national entities like the Forest Service, Bureau of Land Management, and state forestry departments who further distributed these funds under their own banner. Nonetheless, personnel who were aware of the NFP cited its role in serving as the primary source of funding for volunteer groups like the Fire Safe Councils to do education, outreach and hazardous fuel reduction projects in remote communities and private lands, especially in California.

Grizzly Flats KI: “Funding from the NFP removed monetary barriers for reducing fuel loads on private lands. This work can often be beyond the means of many homeowners/small businesses, especially for initial fuel reduction. I doubt there would be much progress if NFP was not involved, in areas that have not been previously treated, due to the expenses entailed.”

Although forest and emergency management officials credited NFP funding as an important step forward in establishing national wildland fire policy and priorities, its failure to include land-use planning component with regard to development in the WUI, however, was cited as a major flaw by land-use planners. It was in this area that the institutional divide and lack of information and coordination between emergency personnel and land-use planners became most obvious.

Red Lodge KI: “Most of the counties’ DES [department of emergency services] has gotten grants under this program to do community wildfire protection plans but they are not communicating with planners and not informing the community. Looking at the way this [NFP] plan is written, it has no focus on land use. It does not tell people about access issues, building on steep slopes. . . maybe some areas should not be built at all. There is that disconnect between land-use planning and fire services as it [NFP]

has nothing at all on what development practices should be in these areas.”

Additionally, this funding did not provide for any sort of exploration of the diverse land-use planning options to avoid conflicts in the interface and promote wildfire safe building practices. Planners were of the opinion that with no solid planning schemes for either prohibiting development in certain areas or design restrictions, the program had little relevance for them.

Red Lodge KI: “They [agency personnel] are really focused on certain things and the NFP objective itself does not talk about land-use planning, so they do not pick it up. They pretty much go by the NFP objectives. . . nothing in the NFP addresses development. I think if the funding source had a thing on there about coordinating with land-use planners to talk about development standards, their conversation would surely include it.”

In contrast, forest managers and fire officials valued the NFP for various fuel reduction projects as well as aiding them in working collaboratively with communities, and enabling programs to educate residents about the underlying threats and strategies to reduce wildfire danger. However, they rarely commented on the lack of land use planning focus in the NFP.

3.5. Education of WUI Residents and Visitors. Approximately 95% of the study participants felt that public education and outreach efforts played a vital role in bringing about gradual changes in the overall planning decisions and also showed great potential for enhancing social capital within at-risk communities; this corroborates previous research [62]. Interviewees stressed that on-going education was particularly crucial in communities having a large transient population base or tourists, less familiar with the fire risk as well as existing wildfire regulations. They felt that visitors needed to be sensitized through information and education about the unique yet susceptible environment of the study’s WUI communities. Furthermore, planners also saw education as part of their duties, and a task that needed to be re-done constantly in most of the study areas.

Ruidoso KI: “Education of visitors is a constant concern and the department of forestry has started printing brochures to make people aware of the inherent danger of living in such a unique environment with high winds and abundant forest growth in the village. The danger is often from people who come up to the mountains and have no idea of what we might face in case an errant fire was to happen by some action of theirs. The mindset of these visitors needs to be worked at and they have to be sensitized through information and education about this susceptible environment.”

3.6. *Other Outside Influences: Insurance and Its Role.* When we started this research, we were not focused on issues of homeowner insurance. But through the interviews, it became clear that insurance companies were a missing ingredient.

Colorado KI: “The interesting thing to me always is that insurance companies play a larger role in this. . . I don’t see my home owners’ insurance premiums going up even though I live in an extremely vulnerable area that has been identified as high risk. There should be some consequence for my choice and my unwillingness to prune back vegetation on my property and conversely, there should be some rewards for doing that as well.”

Almost all agency officials in California, Colorado, Montana, New Jersey, and New Mexico case study areas noted that insurance companies could have a significant impact on homeowner preparedness by making wildfire mitigation a requirement for coverage, and described this as the best way to address the challenge of on-going land clearing and other homeowner mitigation practices. As described by a land-use planner from Berkeley Township:

Berkeley Township KI: “If you were to qualify for the wildfire insurance, you would have to have a hazard mitigation plan that would deal with evacuation routes. . . and basically a plan for dealing with wildfires in the area.”

Ruidoso, New Mexico in fact, was quite ahead in this context where compliance certificates issued to homeowners once they had reduced fuel loads on their property were being used towards their insurance claims. This policy approach deserves further exploration.

4. Discussion

The study addresses the importance of land-use planning in hazard mitigation and the role of planners in wildfire preparedness in wildland-urban interface (WUI) communities. In this research, we found that planners viewed their role as mediators, facilitators, advisors, and educators (which coheres to the literature on planners’ roles—see [63–65] while trying to bring a more comprehensive approach to the conversation by taking into account all factors—environmental damage, sustainability, protection of habitat, water/air quality, fire-proof construction, site orientation, and so forth. Our study results emphasize that land-use and forest planners on the front line of the WUI see a strong and immediate need for revising building codes and regulations pertaining to development in the WUI areas by siting future growth in areas that avoid natural hazards to minimize risk to life and property, and by maintaining fire breaks and fuel load reductions when homes do get built. This finding differs from previous research which focuses on hazardous fuel reduction, firewise construction, creation of defensible space, and homeowners’ wildfire mitigation decisions as some key elements of preparedness.

Perhaps surprisingly, legal authority to use a public safety argument to prevent development in the WUI was never

mentioned in the interviews. Given that public protection is the foremost responsibility of zoning, and that building in the WUI clearly creates a safety hazard for both residents and fire fighters, this seems like an obvious argument for advocating towards greater land-use control in the most fire-prone and difficult to defend areas. We discovered that planners apparently felt that the strength of private property rights and limits to current regulations were such that this sort of more far-reaching justification was not feasible, at least currently. Interviewees in the case study areas of California, Colorado, Montana, and New Jersey described the need to establish clear growth management goals, polices, and implementation strategies within the context of wildfire hazard mitigation. Previous studies indicate that actions in this context are definitely occurring in some states. Planning agencies in Colorado, Florida, and Montana are focusing on regulating the design and improvement of subdivisions, and compliance with the objectives and policies of their communities’ comprehensive plans [66, 67]. In Florida, New Jersey, and New Mexico, the emphasis was on mitigation in new and upcoming developments through regulations that required defensible space, fire-resistant construction, and “Firewise” designs [68]. Furthermore, the study findings reaffirmed the results of previous research that most WUI communities across the country were in the process of adopting land-use based hazard mitigation programs under which covenants or deed restrictions may include requirements for residents to maintain appropriate fuels reduction measures on their property [54, 55, 69, 70].

The American Planning Association’s “Growing Smart” project recommends that wildfire planning in communities should be part of a larger natural hazards plan that identifies all potential hazards including flooding, wind, storms, or geological conditions [5, 71]. Our interviewees stressed that working jointly with diverse groups would facilitate the creation of a useful and all encompassing hazard plan. Through our interviews, we established that more frequent interaction between planners and emergency managers, in planning and implementing hazard mitigation might allow wildfires to be thoroughly integrated into local planning activities and improve inter-agency dialogues and organizational capacity. Sturtevant and Jakes [72] also found that greater focus on collaboration by land management agencies, local government leaders, fire districts, and fire education/mitigation staff could maximize and mobilize needed resources, increase communication capacities, and levels of acceptance and trust, allowing wildfires to become more natural over time, and less catastrophic as a large-scale event.

As important as initial site design and development location is, “firewise” practices need to be reproduced annually. Thinning and hazardous fuel reduction coupled with strict adherence to outdoor safety regulations was deemed to be quite effective as a first step towards wildfire safety by the interviewees. Additionally, we found that insurance agencies could be a major catalyst in promoting wildfire-safe development practices in at-risk communities. At least one insurance company, State Farm, has started to create a market incentive for mitigation by initiating a pilot program for assessing policyholders’ properties for wildfire risk and requiring them to be “firewise” [68].

The study results indicate that there is a need for action, and that appropriate steps are known, but that impediments are significant. We found strong support for replacing archaic land-use laws and the need for modifying current state-enabling legislation, which may enable local planning and building departments charge a premium from developers for the provision of emergency services (water and access) in the vulnerable WUI subdivisions, and that local governments needed to incorporate inspection of building plans before approval to reduce fire hazard. An important study finding was regarding the potential for collaborating with homeowner insurance companies as they may have the ability to reveal the true cost of building in fire-prone areas.

Public safety is undoubtedly the most powerful legal rationale for land-use regulation, and fire protection of any kind essentially involves safety concerns [18]. Our research established that planners needed to identify high-risk WUI areas and seek opportunities to relocate development elsewhere. From a planner's ideal perspective, we think that in many of these high-risk areas, arguments for public safety should prevent building at all so that forests could burn in a more natural regime without threatening human life or property. Even without this sort of stronger land-use control, communities could utilize site reviews and condition building approval on "firewise" building practices. A sound knowledge of these codes might allow planners to balance concerns about fire protection and the building site, landscape, and structure [69]. On a site-specific scale, residents in fire-prone areas should be encouraged to take a comprehensive approach towards the creation of defensible space in and around their community [56, 73].

The recent deaths of firefighters working in the WUI imply that it is not just homeowners who are at risk, but also emergency responders. As indicated by the interviewed land-use planners, local fire departments in the WUI communities should encourage increased involvement of planners in public hearings to negotiate safer zoning of future developments, and enforcement of brush-clearing policies. Through regular attendance and feedback at these meetings and review procedures, fire officials may perhaps forge and strengthen working partnerships with the local planning agencies. It would be worthwhile if federal agencies in the region could support planning and protection in the WUI along with training and equipping crews to fight structural fires [41]. We assume that this would foster the essential interconnection between the public lands and WUI private landholdings, forming the basis for effective interaction and collaboration as well as an equitable sharing of responsibilities and costs of management among the varied stakeholders. An important study finding was regarding the increased participation and input of emergency management personnel and forest service staff in the master planning process, which would ensure their support for more restrictive land-use in the most at-risk areas.

We found that land-use planners needed to be better integrated into the hazard planning process, rather than leaving this component to emergency management and fire officials only. Legislation may certainly advance these inter-agency links. The Colorado State Statute, commonly referred to as

Senate Bill 35, for example, requires that a person or entity subdividing a property into parcels of 35 acres or less on unincorporated land to submit geologic or geotechnical reports to the county as part of the preliminary plan application process [74, 75]. We think that if this was extended to include wildfire hazards, planners would definitely consider wildfires extensively during development reviews, as well as have the authority to deny development based on high fire risk.

An important starting point for agency officials would be to create stronger links between long-range planning and hazard mitigation efforts aimed at avoiding wildfire threat [76]. The Institute for Business and Home Safety [77] conducted a survey in 2001 that revealed that several jurisdictions fail to integrate their land-use planning with hazard mitigation and disaster safety planning [78]. However, the wildfire components of natural hazards plan that do exist, focus heavily on mitigation and not land-use planning that considers hazard avoidance [74]. This might partly be due to wildfire mitigation plans being referred to fire and emergency management officials who plan for hazards autonomously—community planners are not engaged except for application approvals resulting in poor communication between development departments and local agencies [10, 56]. We believe that incorporating mitigation measures in an integrated development planning exercise may provide an opportunity to increase participation of all departments responsible for working towards safer development practices in the WUI. Because integrated plans cover a specified area and address a particular array of resource values and social and economic interests, it is important that they relate to other land-use plans and management activities.

The study participants also indicated that education and outreach efforts should be a priority for all agency personnel, both in terms of gaining an awareness of varied wildfire mitigation strategies like prescribed burning for hazardous fuel management, and informing the community. Furthermore, such initiatives were crucial in disseminating information on wildfire ecology to enable stringent development and zoning standards as well as exploring alternate mitigation techniques. All interviewees highlighted the need to educate themselves as well as WUI residents in their regions. Educational sessions by local forest and fire departments could serve as a vehicle for outreach for year round/seasonal residents and tourists alike as mentioned by the interviewees from the New Mexico and Montana case studies. Communities needed to be aware that reliance on limited fire suppression resources is a dangerous and costly response to the growing WUI situation [74]. As indicated by the study results, there is a pressing need for agency officials to communicate these tradeoffs to the community as part of their outreach and education efforts to better understand who is bearing the true costs and risks of WUI growth.

5. Conclusion

More and more communities across the country are now shifting their focus from responding to disasters to mitigating the impact beforehand through community plans and

ordinances. Just as the WUI is the interface of wilderness and human lands, planning for these areas needs to effectively include urban planners, emergency planners, and forest agency personnel. This needs to occur in the planning and on-going management phases, for both the wildlands and the residences. Improved planning in the form of sprawl-limiting policies and land-use law reform would reduce the burgeoning costs of wildfire suppression and risk fewer lives in the WUI communities. It is not enough to put mitigation strategies into development codes; there also needs to be periodic review to see if those mitigation steps are still being practiced by the homeowners in the WUI.

There appear to be several key steps in this effort. First, given how deeply intermixed the WUI landscape is, planners, fire officials, forest managers, and other departments need to work together on risk mitigation plans. Second, these plans need to result in specific considerations of fire danger in comprehensive planning and zoning, and “firewise” site design requirements. It will be politically helpful if local emergency and forest agency personnel help make the case for safer development practices, so that responsibility does not rest on the planners alone. Thirdly, given that landowners are going to have to continue to implement the mitigation techniques for their lands and must provide the political support to see the fire regulations through, agencies and planners need to engage and educate residents on the necessity of wildfire in forest ecology as well as methods to prevent wildfire damage to homes when wildfires do occur. Finally, for support, planners can look at the insurance industry and firefighters themselves as the most likely candidates for developing meaningful partnerships. Taken together, these steps will help facilitate wildfire safety in at-risk communities.

Acknowledgments

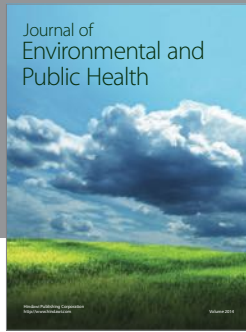
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