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Name of Faculty Advisor

Signature of Faculty Adviser

Date

GRADUATE SCHOOL

Interpreting federal policy at the local level: The case of the wildland-urban
interface in community wildfire protection planning

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Stephanie Anne Grayzeck

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Abstract

In 2003, the Healthy Forests Restoration Act (HFRA) called for communities at-risk of wildfire to develop Community Wildfire Protection Plans (CWPPs), requiring local, state and federal actors to work together to address hazardous fuels reduction and mitigation efforts. This paper explores local response to HFRA and CWPPs in the Eastern U.S., specifically if and how communities are using the policy incentive to identify the wildland-urban interface (WUI). We conducted document review of Eastern CWPPs, as well as qualitative analysis of in-depth interviews with participants in four case studies. We found tremendous variation in local response to HFRA, with plans completed at multiple scales and utilizing different planning templates. The WUI policy incentive was not used in all CWPPs, suggesting that the incentive is not as useful in the Eastern U.S., where public land is less dominant. Even so, many communities in the East completed CWPPs to improve their wildfire preparedness.

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List of Abbreviations

HFRA	Healthy Forests Restoration Act of 2003
CWPP	Community Wildfire Protection Plan
WUI	Wildland-urban interface
NFP	National Fire Plan
JFSP	Joint Fire Science Program
USFS	United States Forest Service

Introduction

One of the basic tenets of policy is the ability to influence and change behavior for an improved societal condition. In some instances policy “enables people to do things that they might not otherwise do” (Schneider and Ingram 1989). An example of this intent to change behavior can be observed in government response to natural disasters, which in recent years has reoriented emergency management systems away from only post-event response, and placed greater emphasis on loss reduction through mitigation, preparedness, and recovery programs (Cutter 2000). In the case of wildfire management, there has been a noticeable policy change from primarily fire suppression to a more complex agenda of suppression, preparedness, mitigation, and community assistance (Jakes and Nelson 2007). Passed in 2003, the Healthy Forests Restoration Act (HFRA) continues this policy agenda by promoting collaboration around wildfire management and encouraging preparedness in at-risk communities, in the form of Community Wildfire Protection Plans (CWPPs). But, how have communities responded to this latest policy, intended to reduce wildland fire risk through mitigation and preparedness? This article explores the local interpretation of HFRA and CWPPs in the Eastern United States, in this policy attempt to promote collaborative behavior in wildfire planning across the landscape.

Background and Literature Review

The emphasis on increased collaboration and community involvement in wildfire management follows a rising trend in collaborative planning around many natural resource and environmental policy issues (Koontz and Johnson 2004). Collaboration is

identified as a process by which diverse stakeholders work together to resolve a conflict or develop and advance a shared vision (Gray 1989). Natural resource and ecosystem management issues often deal with fragmentation across geographic, political, and ownership boundaries. Proponents of collaboration vouch that it can produce better decisions in these situations, and improve the chances that decisions will be implemented (Wondelleck and Yaffe 2000; Daniels and Walker 1996). Researchers have explored collaboration around a number of natural resource issues, including Endangered Species conservation (Weber *et al.* 2005), community forestry (Wilson 2006), watershed partnerships (Koontz and Johnson 2004), and farmland preservation planning (Koontz 2005). Collaboration has been promoted in wildland fire management as an important tool for increasing and improving community wildland fire preparedness (Jakes and Nelson 2007; Sturtevant *et al.* 2005; Jakes *et al.* 2003).

But what brought about this change in wildfire policy to encourage greater collaboration and community involvement? The United States Department of Agriculture (USDA) Forest Service was initially created in 1905 to manage the vast forestlands transferred from the Department of Interior, and also to engage in active fire suppression (Busenberg 2003). At the time, several catastrophic wildfires had burned millions of acres and killed thousands of people across the country (Pyne 1982). For the next 60 or 70 years, wildland fire management was dominated by a policy of fire suppression, in which any and all fires were extinguished as quickly as possible (Busenberg 2003). While this policy succeeded in reducing the number of acres burned, the exclusion of fire from many forest ecosystems resulted in a buildup of hazardous fuels (Stephens and Ruth 2005; Dombeck 2004). In response to scientific studies on fire ecology and the benefits

of prescribed burning, prescribed fire was formally included in federal forest management beginning in the 1960s and 70s, but suppression remained the main task of the Forest Service and other land management agencies well into the 1990s (Stephens and Ruth 2005).

At the same time, more people began moving out to fire prone areas, either for permanent or seasonal living (McKinley and Johnson 2007; Stewart *et al.* 2006; Radeloff *et al.* 2005; Duryea and Vince 2005). This migration of people into the wildland-urban interface (WUI), “where houses meet or intermingle with wildland vegetation,” (USDA-USDI 2001a) has placed more lives and property at risk for wildfire destruction. Following a severe wildfire season in 1985, the federal government recognized the need to address wildfires moving into these increasingly populated areas. As a result, the National Fire Protection Association joined forces with the USDA Forest Service to form the National Wildland/Urban Interface Fire Program. This effort later became known as “Firewise” which promotes knowledge and preparedness for wildfire in residential or urban settings (FIREWISE.org July 2007).

By the mid 1990s, the combination of an increasing population in the WUI, the buildup of hazardous fuels from years of fire suppression, escalating suppression costs, and severe wildfire seasons brought on by drought and insect infestations prompted the first comprehensive federal fire policy for the Departments of Interior and Agriculture. *The Federal Wildland Fire Management Policy and Program Review of 1995* emphasized the importance of fire as a natural process, as well as the need for agencies to work together to reduce hazardous fuels and engage communities in fire management (Stephens and Ruth 2005). Five years later, the National Fire Plan (NFP) grew out of a

report from the Secretaries of Agriculture and Interior, after 8.7 million acres burned in the wildfire season of 2000 (USDA-USDI 2000). The NFP expanded on the 1995 policy, with “the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future” (NFP 2007). The NFP was implemented using the Western Governors’ Association’s *10-Year Comprehensive Strategy—A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment*. Emphasizing the core guiding principles of collaboration, priority setting and accountability, the *10-Year Strategy* and the NFP include four main goals of 1) improving prevention and suppression efforts, 2) reducing hazardous fuels, 3) restoring fire-adapted ecosystems, and 4) promoting community assistance (WGA 2001). Federal fire policy was updated in 2001 to reflect elements of the NFP and the *10-Year Strategy* (USDA-USDI 2001*b*). The emphasis on local and collaborative action related to wildfire management encouraged by the NFP was further strengthened with the Healthy Forests Restoration Act (HFRA) of 2003 by encouraging at-risk communities across the country to complete CWPPs.

As a result the policy change over the past 20 years, there has been an increasing contribution from research on preparedness and community involvement in wildfire. Several studies detail homeowner perspectives about prescribed burning (Loomis *et al.* 2001), fuels reduction (Daniel *et al.* 2006; Winter *et al.* 2002; Vogt 2002), and defensible space (Nelson *et al.* 2005; Nelson *et al.* 2004). In a study of several at-risk communities across the country, the research team stressed the importance of leadership and the formation of networks around community wildfire preparedness (Lang *et al.* 2006; Jakes *et al.* 2003; Kruger *et al.* 2003). When community level response to wildfire threats in

New Mexico was examined, researchers found social responses were equally important to structural responses in effectively addressing wildfire threats (Steelman and Kunkel 2004). Other research has explored the federal and state influence on community response in three southwestern states, revealing that while the federal government provides direction and funding, state governments exercise influence over community response through organizational arrangements, programmatic decisions, and access to funding (Steelman *et al.* 2004)

Programs such as Firewise, the National Fire Plan, and the Healthy Forests Restoration Act all emphasize working with local communities to reduce their risk of wildfire. In order for land managers and agencies to accomplish wildfire mitigation measures across ownership boundaries, it is important to further understand the dynamic and diverse nature of these communities (Cheng and Becker 2005; Jakes *et al.* 2003), but this is no simple task. Not only is it difficult to stimulate local response to natural hazards, but incentive and collaborative policies—such as CWPPs—can meet with considerable variation in local responses (Berke 1998). Field and Jensen (2005) suggest exploring community experiences implementing land use and hazard mitigation measures as a way to formulate an evaluation framework for policy that could assist both communities and land managers with ways to improve their wildfire preparedness. In addition, there has been a call to evaluate the effectiveness of collaborative processes as a means to understand what can and cannot be expected of them (Conley and Moote 2003). The relatively recent passage of the HFRA with a call for collaborative CWPPs creates, an opportunity to explore how diverse local authorities are responding to and implementing a federal hazard mitigation policy.

HFRA, CWPPs and the Wildland-Urban Interface

This paper focuses on Title I of Healthy Forests Restoration Act (HFRA), which outlines expedited procedures for hazardous fuel reduction projects and calls for communities to complete Community Wildfire Protection Plans (CWPPs). These expedited procedures include shortened environmental analysis and pre-decisional administrative review for hazardous fuels projects, as well as encouragement of expedited judicial review (HFRA 2003). CWPPs, as described in HFRA, require collaboration between the local fire department, the state agency responsible for forest management, and relevant local government, in consultation with adjacent Federal land management agencies. The plans must 1) identify and prioritize areas for fuels reduction, and 2) provide recommendations to reduce structural ignitability throughout the community (HFRA 2003). In addition, communities that complete CWPPs can identify their own wildland-urban interface (WUI), and projects in these areas are eligible for the expedited review. In fact, federal agencies are required to spend at least 50% of their mitigation funds in the wildland-urban interface.¹

While in general terms the WUI is considered “where structures meet or intermix with wildlands,” in 2001 the federal government defined the WUI as an area with at least 1 house per 40 acres density (USDA and USDI 2001*a*). According to HFRA, the wildland-urban interface consists of “an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary in a community wildfire protection plan” (HFRA 2003). Essentially, communities that complete CWPPs can define and

¹ As of 2007, the \$760 million authorized in HFRA has never been appropriated. As a result, this guideline applies to existing fire management money from the National Fire Plan.

identify WUI in or near their planning area. Policy summaries and documents related to the HFRA and CWPPs, such as the Society of American Forester's handbook "Preparing a Community Wildfire Protection Plan" and National Association of State Forester's "Community Wildfire Protection Plans: A Briefing Paper" emphasize this opportunity communities have to establish a locally appropriate definition and boundary for the WUI (SAF 2004; NASF 2005).

This paper examines the interpretation of the wildland-urban interface concept in CWPPs as an opportunity to evaluate how a policy incentive introduced in federal legislation is used by local governments and communities. By establishing a locally interpreted WUI boundary, communities have the opportunity to address their specific needs and take local control of mitigation efforts. One important aspect of defining the WUI in CWPPs is the fact that the WUI boundary can include adjacent public land, allowing for the possibility of communities influencing action on public land to reduce their wildfire risk. The WUI boundary itself becomes a negotiated concept to define space, and may create common ground among the diverse participants involved in fire management, something previous research (Jakes *et al.* 2003) has identified as important for wildfire preparedness. In order to address the larger question of how communities in the East are responding to HFRA, we explore several questions in this paper:

1. *How is the concept of the Wildland-Urban Interface used in CWPPs?*
2. *What factors influence the WUI definition and designation?*
3. *Do communities redefine the terms and boundaries of the WUI to meet local needs?*
4. *What role does the WUI play in prioritizing fuels reduction activities?*

Providing an initial assessment of CWPPs in the Eastern U.S. will offer specific insights for HFRA analysis, but also general insights about *how* communities respond to policy.

Such information will be useful not only to the communities and agency staff that have yet to engage in community wildfire protection plans, but also for land managers and policy makers who operate under natural resource planning and policy guidelines.

Methods

This paper is part of a broader research project supported by Joint Fire Science Program (JFSP) investigating the development and implementation of CWPPs across the U.S. The goals of the larger project are to improve the ability of stakeholders to work together collaboratively to reduce the risks of wildland fire and to enhance the long-term social capacity of communities to address wildfire risk (JFSP 2007). While the project includes 13 case studies of CWPP development across 8 states, this paper focuses CWPPs in the Eastern U.S. and includes 4 Eastern case studies.

We define the Eastern U.S. as the 33 states in Regions 8 and 9 of the U.S. Forest Service. The East was chosen for analysis based on a number of factors. Using the Federal Register definition of the wildland-urban interface, a spatial analysis of land cover and census block data performed by Radeloff *et al.* (2005) found that while the greatest number of houses in the WUI is in California, the Eastern U.S. actually contains the greatest *extent* of WUI in the 48 contiguous states. Wildfire is often seen as a “western problem” but large fires are still a part of the many forest ecosystems and threaten communities in the eastern U.S., as evidenced by the recent 2007 fires in Minnesota, Florida, and Georgia (AP May 7, 2007) that collectively burned over 300,000 acres. The majority of social science research related to wildfire in the East has focused on homeowner perceptions and preparedness (Nelson *et al.* 2005; Nelson *et al.* 2004;

Monroe and Nelson 2004; Monroe *et al.* 2003; Winter *et al.* 2003; Jakes *et al.* 2003). Examining how Eastern communities have responded to HFRA and the call for CWPPs will broaden the understanding of wildfire planning and policy as a whole and its implementation in states east of the Rocky Mountains. To address the research questions, we used two methods of data collection and analyses: 1) document review of available CWPPs in the East and 2) qualitative analysis of 4 case studies. This mixed methods approach allowed for a broad look at how the concept of the WUI is used in Eastern CWPPs, which was then complemented with the in-depth insights from the case studies.

CWPP Document Review

In order to qualify for document review, plans had to come from one of the 33 states in Forest Service Regions 8 or 9, be completed or updated after January of 2004 after the HFRA authorities/guidelines were announced, and show evidence of collaboration between the three entities HFRA requires: local government officials, local fire department, and state forestry agency. This could be a simple list of the participants, or actual signatures.

Locating and collecting Community Wildfire Protection Plans in the Eastern U.S. proved to be a difficult task. An initial internet search conducted in February 2007 using Google and the search terms “state name community wildfire protection plan/CWPP” turned up limited results. To facilitate the gathering of plans, a list of CWPPs in Region 9 was obtained from the Forest Service, and we contacted states that had plans via email and phone. For Region 8, all states were contacted to determine the presence or absence of CWPPs. WUI coordinators were asked to provide completed

CWPPs from their state, although any type of wildfire plan may have been sent. We coded available plans that met the requirements noted above for study variables including: 1) scale of the plan, 2) participants in the plan, 3) use of the WUI concept, and 4) identification of WUI or interface areas.

Using the USFS list and/or the confirmation of state officials, 12 of 33 states in the Eastern U.S. were found to have no completed CWPPs as of April 30, 2007, although some plans were in progress. Six of the remaining 21 states did not respond to email or phone call inquiries. CWPPs may exist in these states, but time constraints prevented further attempts to contact state WUI coordinators. A total of 44 wildfire plans were obtained from the 15 remaining states. Of the plans sent, some did not meet the CWPP requirements established for review. As a result, 29 of the 44 collected CWPPs, representing 10 states, were used for document review. Several states did not send all of their completed CWPPs, but rather a smaller subset. Therefore, this population does not represent a complete sample of CWPPs in Regions 8 and 9, but rather an initial assessment of how communities are responding to HFRA in their CWPPs.

Case study methodology

Case study data were collected from in-depth, semi-structured interviews with key informants in the 4 Eastern CWPP case studies from the JFS research project. We selected case studies using established contacts with the Forest Service, internet research, and contact with various state officials to determine CWPP activity in the East. Site selection followed guidelines established for the broader JFS project. These criteria included: a completed CWPP, multiple participants, geographic distribution across the

study area, presence of federal land, varied planning levels, and varied levels of community capacity. We visited each of the sites for 4-5 days, touring the communities and adjacent forests. The 4 communities were: Lake County, Minnesota; Barnes and Drummond, Wisconsin; High Knob Owner's Association in Front Royal, Virginia; and Taylor, Florida. All four plans from these case study sites were also used in the CWPP document review.

Sampling strategy for selecting interviews consisted of contacting the coordinator/facilitator of each plan to identify individuals who were involved in the process. When the documents were available, interview lists were supplemented by reviewing meeting minutes for participant names, and individuals who attended 2 or more meetings were contacted. The interviews themselves also reinforced key informant selection, as no names were mentioned during interviews that were not part of our sampling list. Across the four case study sites, we were able to talk with approximately 85% of CWPP participants. We were careful to interview a diversity of stakeholders in each case study, including forestry, fire, and emergency management professionals at the federal, state, and county level, local elected officials, volunteer fire department members, non-government organization representatives, homeowner's association members and staff, and local homeowners.

The research team developed a 21 question interview guide of closed and open-ended questions that covered three main components: the context of the community, the CWPP process itself, and perceived outcomes of the plan. All interviews were recorded and transcribed verbatim. The following interview questions that informed our research

questions about the WUI were read by two researchers for themes, which were organized and interpreted using the grounded theory approach of Strauss and Corbin (1990).

- *Did the team try to define the WUI? If so how? Tell me about how the Team defined the WUI? What factors went into deciding where to draw the line?*
- *Tell me about how the team prioritized fuel reduction activities*

While the first question specifically asked participants what was used to identify the wildland urban interface for the CWPP, the second question offers some insight into whether or not these same factors were important for completing work to lower the wildfire risk to the community.

We conducted a total of 58 interviews in the four case study sites. The number of interviews per case study varied depending on how many people were involved in the CWPP, as well as how many people we were able to interview. Sixteen interviews were conducted for Lake County, Minnesota; 13 interviews in Barnes and Drummond, Wisconsin; 18 interviews in High Knob, Virginia; and 9 interviews in Taylor, Florida. Interviews ranged from 25 minutes to 2 hours in length, depending on how involved the interviewee was and the extensiveness of their responses. Due to the limited degree of some participants' involvement, the wildland-urban interface questions were not asked of all the informants, particularly in Virginia, where homeowners did not use the WUI terminology.

Case study site descriptions

Lake County, Minnesota

Lake County is located in the Arrowhead region of northeastern Minnesota, bordered on the north by Canada and the south by Lake Superior. The county is fairly

rural, with most of the 11,058 residents living in the southern end of the county near Lake Superior. Of the 1.34 million acres in the county, approximately 78 % is publicly owned. As much as 89% of the county is forested, which includes large tracts of the Superior National Forest and the Boundary Waters Canoe Area Wilderness. In Lake County, increases in fire frequency generally correspond with severe droughts that occur in 20 to 30 year intervals. A 1999 windstorm and resulting blowdown has increased the fuel load in the north and continues to shape wildfire policy and planning in the area. Since the summer of 2006, two large fires have burned in the Superior National Forest in neighboring Cook County. The CWPP process for Lake County included USFS representatives from the Superior National Forest, the Minnesota Department of Natural Resources, Lake County Board, commissioner and land department staff, Sheriff's office, and local volunteer fire departments.

Barnes and Drummond, Wisconsin

Barnes and Drummond are two small towns located in northwestern Wisconsin, each with a population around 600 people. Approximately 70% of the 172,056 acre CWPP planning area is under public ownership and management. The western half of the planning area around Barnes includes large tracts of Bayfield County forest, while the eastern half around Drummond is almost completely surrounded by the Chequamegon-Nicolet National Forest. The planning area has experienced more than 80 wildfires in the past 20 years, although most have been relatively small. In addition to the fire-prone sandy jack pine barrens around the town of Barnes, several windstorm events have moved through the Drummond area causing blowdown areas, providing a large amount of wildland fuels. The combination of these factors has resulted in an increased

awareness about wildland fire events and the development of the Barnes-Drummond CWPP. Participants in the Barnes-Drummond CWPP included the Wisconsin Department of Natural Resources, U.S. Forest Service representatives from the Chequamegon-Nicolet NF, Bayfield County forestry and emergency management, elected Board members from both towns, as well as local fire chiefs for each town. The CWPP was developed with the help of the Northwest Regional Planning Commission, a Wisconsin quasi-governmental planning agency, who was responsible for writing the plan, facilitating meetings, and compiling meeting minutes.

High Knob Owner's Association in Front Royal, Virginia

High Knob Owner's Association is a gated community of about 400 homes, just outside of Front Royal, Virginia. High Knob is located in Warren County, which contains portions of nearby Shenandoah National Park and George Washington National Forest. However, the planning area for this CWPP was focused specifically on private land within the subdivision. The subdivision is located on a mountainside, with a steep gradient to the top of the mountain and is characterized by dense hardwoods with scattered conifers. The fire risk is considered low, but there were major concerns about the buildup of fuels on private property, as well as issues with access/egress and emergency response capability. After an initial assessment by the Virginia Department of Forestry (DOF), the High Knob Board of Directors and staff were contacted about completing a CWPP and obtaining Firewise/Communities USA status. The nearby Linden volunteer fire department was included in the plan, as well as several homeowners, and the Warren County Administrator, who also happens to be a resident.

High Knob obtained Firewise/Communities USA status as a result of the plan and the subsequent implementation.

Taylor, Florida

Taylor is a small, relatively isolated community in northeastern Florida, located about 45 miles from Jacksonville. The county estimates that there are approximately 425 structures and 1,500 residents in the Taylor area. The community of Taylor is bordered on the southwest side by Osceola National Forest, John Bethea State Forest to the north and east, and private industrial timberland to the southeast. In recent years, private industrial forests have been sold to real estate developers and public land management agencies. Wildfires are common in and around the community, as several major fires have threatened Taylor in the past 10 years. This includes the recent Bugaboo Fire in May 2007, which burned over 120,000 acres and caused the evacuation of Taylor residents for several days. The CWPP was initiated by the Florida's Department of Forestry, and in later meetings the Osceola National Forest, Baker County Fire Department, Taylor volunteer fire station, and local pastors were brought into the process.

Results

The primary objective of this study was to discover how a range of communities in the Eastern U.S. interpret federal policy designed to encourage local response to reducing wildfire risk. We found many types of wildfire plans done in the East, ranging from wildfire hazard assessments completed pre-HFRA to Firewise-linked plans to stand alone CWPPs. The wildland-urban interface was used or addressed in just over half of the

reviewed CWPPs, with tremendous variation among those plans. We found the assessed plans were developed at four planning scales, using a number of template typologies. Both the planning scale and template appear to influence if and how the WUI concept was used in CWPPs. In addition, participants in the CWPP process influenced how the community and planning team addressed the WUI. Local influence, agency participation, and the presence of an experienced planning organization were all found to contribute to the formation of a WUI boundary. Finally, we offer examples from our case studies on how identification of the WUI related to prioritizing fuels reduction projects and moving forward with implementation.

What is a CWPP?

Many types of wildfires plans were identified, not all of which met the guidelines of HFRA. Several of the plans not used for the document review were wildfire hazard assessments done for communities by state forestry professionals. These plans provided a summary of wildfire hazards, as well as suppression resources, but did not show evidence of collaboration between the 3 entities required under HFRA. In some cases, these assessments may have served as precursors to a CWPP, as indicated by state officials with whom we spoke. In addition, one state provided a template used for all of their CWPPs, which does call for collaboration, but chose not to send actual plans due to their interpretation that the plans contained sensitive information. A few of the fire plans received were extensive and did include collaborative efforts, but were completed prior to the passage of HFRA to meet different federal fire policy objectives, such as the Fire Management Plan for Brookhaven National Laboratory in New York.

Several CWPPs in the East served dual planning purposes. Some CWPPs, particularly in the south, doubled as Firewise Action Plans that communities used to obtain Firewise Communities/USA status. In fact, 11 of the 29 communities used for the CWPP document review had obtained Firewise/Communities USA status as of May 2007. In addition, a few CWPPs functioned as Natural Hazard Mitigation Plans required by the Federal Emergency Management Agency (FEMA), such as the CWPP obtained from Berlin, New Hampshire.

Flexible policy leads to diverse CWPPs

While HFRA requires the involvement of “local government,” this term is not specified in the law. As a result of this flexible legislative guideline, we found CWPPs developed at a diversity of scales. The “local government” entity ranged from a county commissioner to the president of a homeowner’s association. The four planning scales² identified in the 29 reviewed plans included: county (n = 5), multiple townships (n = 2), city/township (n = 13), and subdivision (n = 9). The four case study CWPPs, which were also part of the document review, represented each of these four planning levels. Typically, at the larger planning scales, there was less involvement from local homeowners. Three of the 4 case study sites involved mainly agency officials working in conjunction with the local fire departments and local government. A majority of the CWPPs used for document review also followed four main planning templates: a ‘southeast’ template used in Virginia, Kentucky, Arkansas, and Florida; a Texas template; an Ohio/Pennsylvania template; and a Minnesota County template.

² In the context of this research, the term “scale” refers to a planning level, not a mapping scale, thus “larger scale” indicates a greater CWPP planning area.

Fifteen of 29 CWPPs reviewed included the wildland-urban interface concept, while the remaining 14 plans did not (Table 1). Of those 15 communities that did identify the wildland-urban interface, there was a gradient of precision regarding how the WUI was identified. It appears that planning scale, the use of a planning template, and the participants in a CWPP process all influenced if and how the WUI concept was used in the CWPP. While some plans used the WUI concept but did not identify specific areas, others singled out specific neighborhoods, road intersections, or even used GIS mapping to identify spatially defined WUI areas. A few of the CWPPs identified the entire planning area as wildland-urban interface, while others subdivided the planning area into different WUI sections. Finally, at least two of the reviewed CWPPs gave a more general statement identifying the WUI as areas near federally managed land, without giving providing much spatial detail.

Important Factors for determining the WUI

While the document review provided an initial overview of *if* and *how* the WUI concept was used in CWPPs, the case study analyses allowed for a more extensive look at what factors CWPP participants considered for establishing the WUI boundary. Three of the four case study CWPPs identified the wildland-urban interface: Lake County, Minnesota; Barnes and Drummond, Wisconsin; and Taylor, Florida.

Seven themes emerged from qualitative analysis regarding the factors participants used to define and identify the WUI: *hazards, values, infrastructure, tools, policy considerations, additional criteria, and difficulties* (Table 2). *Hazards, values, and infrastructure* were the most commonly identified themes across the three cases. Since

the wildland-urban interface is defined in simplest terms as the “area where houses meet or intermingle with undeveloped wildland vegetation,” we expected fuels and structures to play a significant role in the identification of the WUI boundary. While these factors were identified by several participants, several additional factors that were more specific to the case study sites were also important for identifying the WUI. In Lake County, Minnesota for example, many participants identified fuels and structures, but the infrastructure of volunteer fire department jurisdictions and fire incidence were the two most mentioned WUI factors. In Barnes and Drummond, Wisconsin, presence of fuels and structures were also mentioned by a number of participants, but this was in conjunction with various policy considerations pertaining to the Federal Register definition of 1 house per 40 acres and HFRA’s guidance for identifying a local WUI boundary. Interestingly, some Barnes and Drummond participants also noted difficulties agreeing on what exactly the WUI boundary should be:

“That was probably the biggest area of contention, was the [WUI] boundaries and how they were going to be defined.” (Wisconsin case study, July 2006)

In Taylor, Florida however, there was no such conflict, as all CWPP participants unanimously agreed to use public land and private timber industry ownership boundaries as the primary determinant for creating a WUI boundary that circles the entire community:

...that’s kind of our interface boundary...[the line] goes throughout the whole community. Right, so here’s the Osceola, so it goes along the Osceola [national forest] here, and the John Bethea [state forest] is up here, and this is Rayonier [private timber land] over here. (Florida Case Study, March 2007)

Overall, while CWPP participants in all three cases kept in mind the HFRA definition of the WUI, these communities used additional criteria for identifying the actual WUI boundaries. This suggests that some communities engaged in CWPPs are modifying the WUI concept to meet local needs and defining the region using other considerations.

The importance of scale

It is important to consider various scales when creating and implementing policies. The multiple scales at which CWPP development occurred in the study region appears to have played a significant role in whether communities used the wildland-urban interface concept. The more land area included within a CWPP area, the more likely the CWPP was to address the WUI (Table 1). At the subdivision level, identifying the WUI took on less significance. All 14 plans that did not identify the WUI were at the subdivision or small township-level.

Large-scale plans (county and multiple township level) tended to use the wildland-urban interface concept. Compared with subdivision or township level plans that might cover a few hundred acres, the planning area for the Lake County CWPP covered over 1 million acres of private, federal, state and county lands. Given this planning scale, a Lake County CWPP participant said:

“We wanted to cover most of the county with some sort of WUI...wherever we thought that there might be an area that some work needed to be done, we wanted that to be included within a wildland-urban interface area....So if you’re just doing something in a 3 or 4 mile radius around a community, you know, that may not be everything that’s needed to be done. So that’s more of the bigger picture, on more of a landscape level.” (Minnesota Case Study, June 2006)

In this county level plan, the CWPP group expanded the WUI concept to fit a landscape level management vision, and therefore separated the county into various “WUI areas.”

The CWPP ultimately included the entire county in some sort of wildland-urban interface.

There was greater variation within the city/township CWPPs: 7 of the 13 plans at this level identified the wildland-urban interface. Larger cities with more than 10,000 people, covering more land area, were more likely to use the wildland-urban interface concept in the plans. Some of these city level plans identified specific areas; examples include Stillwater, Minnesota and Fayetteville, Arkansas. However, at least one larger city CWPP in Hot Springs, Arkansas simply noted that the wildland-urban interface was considered to be “generally near National Park lands.” This idea of identifying WUI in less specific terms was reflected in at least one other plan in the smaller town of Knifley, Kentucky.

A majority of the smaller township and subdivision level plans did not identify the wildland-urban interface. For example, 4 plans in Arkansas following the southeast template had the opportunity to identify WUI but left the space for identifying “interface areas” blank. These communities were all very small, with between 200-600 structures. In addition, none of the 9 subdivision CWPPs used the WUI concept in their plans. These subdivision level plans ranged from just 63 homes in a Maryland community to more than 400 homes in some of the Virginia and Texas subdivisions. Our Virginia case study of the High Knob Owner’s Association was a community-driven CWPP, where many of the interviewees were homeowners or association staff who did not have knowledge of the wildland-urban interface or fire suppression. When asked about using the WUI concept in CWPPs, the Virginia mitigation specialist who worked with High Knob said:

“I probably didn’t use it...Like I say, I go in and I sit down and talk with these communities as if we’re sitting around your table and talking.”
(Virginia Case Study, October 2006)

This state employee felt the term itself was not accessible to homeowners. For both smaller township and subdivision plans, identifying WUI within may not be as useful for their ultimate goals, since the planning area itself is already considered wildland-urban interface.

The emergence of templates

A majority of the CWPPs used for document review followed planning templates. In conjunction with scale, these planning tools influenced not only how a community addressed the WUI concept in planning, but if they did at all. The “southeast” template used in Virginia, Kentucky, Arkansas, and Florida was adapted by each state for different planning scales. This template differed in the “community background and existing situation” section, where three states included space or line for identifying WUI. For Arkansas and Kentucky CWPPs, this meant identifying “interface areas,” while Florida CWPPs identified the “area of wildland/urban interface” using acreage.

This southeast template was also used in Virginia, but unlike the other state versions, there was no space within the plan to identify an interface area. This omission was likely a result of the fact that Virginia has chosen to work on a subdivision level for CWPPs. Similar to the Virginia version, all the Texas CWPPs used in the document review, which follow a different planning template, did not include a space for identifying the wildland-urban interface. Again, these plans were all at the subdivision

level. Communities working with either of these templates would not be prompted to identify the WUI, since the planning document does not require it.

The three Ohio CWPPs, following one template, pre-define the wildland-urban interface as “any area where potentially combustible wildland fuels are found adjacent to combustible homes and other structures; A zone where man-made improvements intermix with the wildland fuels.” The plans go on to say that “[the community/county] has recognized that conditions in many parts of the property encompassed in their respective fire districts qualify under this definition.” Although the WUI is defined and recognized within the planning area, the concept itself was not defined by CWPP participants.

The fourth template was used in three Minnesota counties, including our case study site of Lake County, Minnesota. These counties divided the entire planning area into “WUI areas” along fire department jurisdictions, and then modified these areas based on the presence of structures and fuel types. All three of these county CWPPs also used the same risk assessment tool to prioritize the WUI areas. Landscape level management played a role in the development of these CWPPs, as our case study revealed, and as a result the WUI was broadly defined.

Participant influence

Participants in the planning process also play an important role in how a community shapes their CWPP and subsequently the wildland-urban interface. Consulting federal agencies, while not official “signers” of a CWPP, influenced whether the concept is used at all, and in some cases what the WUI looked like in the plan. Local

government and fire department members also influenced the WUI boundaries for political reasons or based on knowledge of the landscape. We also found that experienced planners influenced the technical aspects of how a WUI boundary was formed in CWPPs.

The federal consultation role in CWPPs may influence the use of the WUI concept in planning. In the document review, we found 11 of the 29 reviewed plans had federal representative involvement, including agencies such as the U.S. Forest Service, the Army Corps of Engineers, and the National Park Service. It is interesting to note, however, that these CWPPs addressed the WUI concept, albeit with varying degrees of precision. Alternatively, none of the subdivision level plans had any federal involvement, even when there may have been federal land nearby. All of the Minnesota counties that used a broad definition for the WUI had large tracts of National Forest land and extensive federal involvement. Similarly, the large tracts of public land and strong federal presence in the Barnes and Drummond CWPP, may have influenced how those communities identified the wildland-urban interface. Most of the Wisconsin respondents referred to the Federal Register definition as a major factor for determining the wildland-urban interface:

In comes [US Forest Service individual], and [he] starts talking about redefining the wildland urban interface, and that the communities within this process have the ability to redefine the wildland-urban interface, and kept focusing on the idea that okay, one home per 40 acres...[he] brought another perspective in talking about eligibility of funds.” (Wisconsin Case Study participant, July 2006)

Participants in this plan discussed using the WUI policy incentive to plan mitigation on public land that would be eligible for funding, and also qualify for expedited review under HFRA. Taylor, Florida which is a small unincorporated township that may have been less likely to identify WUI, still did so, likely due to the fact that it too is surrounded

by large public land holdings. These results indicate that while there is less federal land and subsequently less federal involvement in Eastern CWPPs, where federal agencies do become involved in a CWPP, the community is more likely to use the WUI policy incentive to influence activities on public lands. For those communities that are not near federal or other public land, and for those at smaller scales, federal involvement is much less likely and therefore communities are less likely to use the WUI concept.

Local participants in CWPPs brought local needs to the table with regards to the WUI, and also provided invaluable local knowledge for the WUI boundary. In Lake County, Minnesota, the County Commissioner, who was identified by a number of participants as a “key player” in the CWPP process, brought both political influence and political will to the WUI boundary decisions. Other participants noted his desire to keep the focus on landscape level management with regards to the WUI:

“[The county commissioner] also wanted [the wildland urban interface] big because he’s, you know, he’s thinking problem assessments, problems and solutions, and so you know for fire that’s a lot of talk, fire starts burning and its burning fast and its going over a lot of area quite quickly.” (Minnesota case study, June 2006)

In addition to local government, local fire department members and local field staff played a key role in WUI boundary decisions, particularly in Minnesota, by providing local and on-the-ground knowledge of the planning area:

“[The WUI lines] vary quite a bit. That was, we went back and forth, basically drawing lines on the map and that’s where the chiefs came in very important, drawing those lines because they know what’s out there exactly, and they know what are the values at risk.” (Minnesota case study, June 2006)

In both Minnesota and Wisconsin, which were fairly agency-driven plans, local fire department members not only brought this local knowledge with regards to fire

suppression and the presence of structures, but they also acted as community representatives.

Finally, we found that the presence of a third party planning commission or council influenced how the WUI was used within a CWPP. Two of the 29 reviewed plans involved quasi-governmental planning commissions who facilitated the CWPP process and wrote the plans: Berlin, New Hampshire and our case study site of Barnes and Drummond, Wisconsin. These two plans contained a level of GIS expertise not seen in the other 27 plans that was used to create detailed WUI boundaries and maps using spatial data layers. In fact, many Barnes and Drummond participants noted the importance of GIS for determining the WUI boundary. The inclusion of an experienced GIS planner who could manipulate landcover, census, and tax parcel data layers allowed the Barnes and Drummond participants to employ a more technical 1 house per 40 acres WUI definition. In addition, this technical expertise was used to employ a GIS risk assessment model to determine the highest risk areas for Barnes and Drummond, influencing the WUI.

Linking the WUI to fuels reduction

With the WUI boundary established, the next step for communities is to identify and prioritize areas for fuels reduction. While a document review cannot provide detail regarding this step, our case study communities provided insight into how the WUI definition related to fuels reduction activities, and also how it linked these to overarching federal fire management goals. The factors that emerged for prioritizing fuels reduction activities were similar to those used to identify WUI boundaries (Table 2). In all three

cases the most common overarching themes used to identify the WUI were also the most commonly used for prioritizing fuels activities: *hazards*, *values*, and *infrastructure*.

However, within these themes, some participants shifted focus to additional factors.

In Barnes and Drummond for example, while participants noted fuels and structures as important for prioritizing fuels reduction activities, emphasis also included access, and what fuels reduction projects agencies wanted to do on an individual basis:

Basically the way we handled that was, for the fuel and hazard fuel reduction, the Forest Service came back with what they felt they wanted to do, Bayfield County came back with they felt they wanted to do, and we came back with what we felt we wanted to do, and so did the towns. (Wisconsin case study, August 2006)

Each agency took on implementation separately. For Taylor, Florida, the WUI boundary established at public land boundaries around the community remained their focus and number one priority for fuels reduction. CWPP participants used the actual established boundary as a baseline for creating a community-wide fuel break that would cut across federal, state, and private lands. Even though the WUI line and fuels reduction cut across different land boundaries, it was still implemented on an agency-by-agency basis, similar to Barnes and Drummond. In general, fuels reduction activities were motivated by the same criteria the CWPP groups used to establish the WUI but specific individual preferences influenced the prioritization of which projects would be completed first.

Discussion

Incentive and collaborative policies intended to reduce natural hazard risks at the local level are often met with considerable variation in local response (Berke 1998). This observation is supported by our assessment of CWPPs and the response to HFRA in the East. We found plans completed at different scales, ranging from small subdivisions to

counties with over a million acres. While several communities were taking advantage of the policy incentive to identify the WUI in CWPPs, particularly those near federal land, many other communities were not using the WUI concept at all for CWPP planning. Since much of the Eastern U.S. is already considered wildland-urban interface (Radeloff *et al.* 2005), that drawing distinct WUI boundaries is a more difficult task. Even among those plans that did identify the wildland-urban interface, there was tremendous variation regarding how they did so.

As previous scholars have noted, even though community level approaches to wildfire can be more effective (Burby and May 1998), state and federal levels of government are often more concerned about wildfire management since they bear the majority of costs associated with suppression (Steelman and Kunkel 2004). Not surprisingly, state and federal government were actively participating in the creation and implementation of CWPPs in the East. State governments in particular are playing a lead role developing CWPPs across the East, which is encouraged by the law, given their inclusion as a “signer” of the plans. Past studies revealed that while federal government influences and encourages community responses through funding, state government exercises control over community response based on organizational arrangements, programmatic decisions, and access to funding (Steelman *et al.* 2004). We found that programmatic decisions made at the state level, such as what scale to work at and what template to use, can influence not only the size of the planning area, but also if and how the WUI concept is addressed within the plans. In Virginia, for example, all of the CWPPs are done at the subdivision level and follow a template that does not include a place to identify WUI. Virginia, as well as Arkansas and Kentucky, have also chosen to

integrate CWPPs with the Firewise Communities/USA program. Along with state direction and guidance, federal involvement in Eastern CWPPs also appeared to influence how the WUI concept was used in CWPPs. While overall federal involvement in CWPPs in the East is predictably less than what we would expect to see in the Western U.S., those plans that did include consulting federal agencies were more likely to identify a WUI, where they might influence action on public land.

Even with state and federal involvement, did we see communities in the East modifying the WUI to address local needs? Yes, in the sense that these communities worked in conjunction with agency staff to identify local problems. While our case study sites that identified the WUI were fairly agency driven plans, the presence of local leaders and local representatives was still important for identifying the WUI, supporting previous studies that emphasized local leadership (Lang *et al.* 2004; Jakes *et al.* 2003) and local knowledge (Jakes *et al.* 2003; Kruger *et al.* 2003) as important factors for wildfire preparedness. The political influence provided by local government, as well as the local knowledge provided by field staff and volunteer fire department members were important for formulating the WUI boundaries.

Another critical aspect of wildfire preparedness is finding common ground among the many participants who engage in wildfire mitigation and suppression activities (Kruger *et al.* 2003). Even with established and specific definitions like that in the Federal Register, the WUI is not a specific place, but rather a set of conditions (NASF 2002) that these CWPP groups had to agree on. When you bring diverse agencies and different levels of government together, it is possible to have disagreement over a negotiated concept such as the WUI. Some CWPP groups were able to achieve this

common ground, such as the planning group in Taylor, where the team unanimously agreed on a WUI boundary that surrounded the community, based on public land boundaries. This easily decided boundary translated into prioritization of a community wide fuel break that crossed several land ownerships. On the other hand, in the Wisconsin case, even with the technical and planning expertise of a trained facilitator, historical precedent and organizational culture (Cheng and Becker 2004), led to difficulty agreeing on how to establish a WUI boundary. Subsequently there was conflict over how to prioritize areas for work and a tendency to define projects within public land controlled by single agencies, rather than across the landscape as a team.

Conclusions

Even though the perceived wildfire threat in the Eastern U.S. is less than that in the West, many Eastern communities are still taking steps to reduce their wildfire risk by completing community wildfire protection plans. Our findings revealed that communities are interpreting HFRA with tremendous variation at the local level; working at different scales, utilizing different planning tools, and involving diverse participants. All of these factors can influence if and how communities utilize the WUI policy incentive in CWPPs. While larger scale CWPPs and those plans with federal involvement identified WUI areas, the policy incentive of identifying the WUI may not be useful for all communities in the East. The incentive is designed to give communities the ability to influence action on public land, but in the Eastern U.S. the majority of land ownership is private. Even though some plans did not use this policy incentive, many CWPPs in the

East are still successfully completing CWPPs and working with agencies to reduce their fire risk by planning mitigation efforts and improving suppression efforts. Many plans were done at smaller scales and focused their efforts on their immediate surroundings and reducing fire risk on private property.

The power of identifying the wildland-urban interface to allow local influence on public land fuel treatments may be greater in the western United States, as evidenced by our Eastern case studies with land ownership patterns similar to that of the West. The use of this policy incentive in Western CWPPs should be investigated, and may provide a useful comparison to the Eastern plans. Even though the WUI was not used in all Eastern CWPPs, the concept itself continues to be valuable as a planning tool because of its ability to frame landscape level issues for local planners. Identifying the WUI gives communities and agencies an opportunity to make management distinctions between lived space and public lands, as well as ecological differences between managed forest/open space and urbanized areas. As this distinction continues to blur and more people move out into the wildland-urban intermix, we may see an evolution of the use of the WUI concept in the context of planning. For now, the WUI remains a good tool for communities and agencies that wish to call attention to landscape level issues.

Appendix A

Table 1. Use of wildland-urban interface (WUI) concept in Community Wildfire Protection Plans (CWPP), across planning scales.

Planning scales				
Template	County	Multiple Townships	Township/City	Subdivision
Southeast (VA, AR, KY, FL)	Used WUI (1)		Used WUI (5) No WUI (5)	No WUI (4)
Texas				No WUI (4)
Minnesota	Used WUI (3)			
Ohio/Pennsylvania	Used WUI (1)	Used WUI (1)	Used WUI(1)	
No Template-Unique • <i>Barnes/Drummond, WI</i> • <i>Berlin, NH</i> • <i>Stillwater, MN</i> • <i>Potomac Vistas, MD</i>		Used WUI (1)	Used WUI (1) Used WUI (1)	No WUI (1)
Total plans	Used WUI (5)	Used WUI (2)	Used WUI (8), No WUI (5)	No WUI (9)
<i>Key: Used WUI = WUI concept used in CWPP; No WUI = WUI not used in CWPP; (#) = frequency of plans</i>				

Table 2. Themes and factors used by participants to define the wildland-urban interface (WUI) boundary.

Themes	Factors
<i>Hazards</i>	general "hazards", fuel loads, fire occurrence/incidence, population (human caused fires), lack of planning
<i>Values</i>	general "values", population centers, structures, timber
<i>Infrastructure</i>	fire department boundaries, public land boundaries, distance from fire station (response time), access/egress
<i>Other Criteria</i>	what needed work, landscape level planning, presence of public land blocks, local concerns
<i>Policy considerations</i>	ability to redefine the WUI, HFRA definition, population density (1 house per 40 acres), federal definition
<i>Tools</i>	condition classes, timber typing, local knowledge, risk assessment tool, fire incidence maps, Madison WUI data, GIS, census data, aerial photographs
<i>Difficulties</i>	confusion/conflict on WUI definition and boundaries, changes to the lines, more information needed

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