4.3 CREATING DEFENSIBLE SPACE IN THE URBAN–WILDLAND INTERFACE: A COMPARISON OF PERCEPTIONS OF SEASONAL AND FULL-TIME RESIDENTS*

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1. Introduction

For decades, residents of urban areas in America have been moving into rural areas that are located in or near heavily wooded natural areas such as forests, parks, and other types of open space. According to U.S. Census figures between 1970 and 1988, rural counties near wildland areas increased in population by 23 percent, compared to an 11 percent growth nationwide (Bailey 1991). This expansion has occurred to such an extent that not only has there been an increase in population and development growth in rural areas near wildlands and other open space, but the growth in primary residences, vacation homes, and commercial development has resulted in many of these areas losing the characteristics of rural America and becoming categorized as urban, hence the term urban – wildland interface (Gardner, Cortner, & Bridges 1985).

As a result of this migration and increased private and commercial development near wildlands, dangers from wildland fire become significantly more complex. The dynamics of forest fire fuels, changing wind conditions, humidity, fuel type, and etc., present unique problems to community firefighters that are trained to deal primarily with structural fires. As a result of the large number of fires around the country during the past few summers and fears that such fires will continue, there are significant concerns regarding the safety of people as well as private and public property located in or near the urban – wildland interface.

While federal agencies and local governments are often viewed as best equipped to conduct fire prevention/protection activities, there is increasing interest in the role that the general public can play in addressing fire management problems in the wildland – urban interface. According to Cortner (1991; Cortner, Swinford, & Williams 1990), it is important to maintain an integrated effort between civic agencies and private citizens in order to address fire management problems in the urban – wildland interface. Well-conducted public involvement activities help keep private citizens informed of the dangers of wildland fire and policies maintained by public agencies. Similarly, public involvement efforts serve to keep public agencies abreast of the public's perceptions of fire policies and strategies, as well as support for strategies designed to manage areas for potential wildland fire such as prescribed burns and mechanical thinning.

In addition to public involvement processes that facilitate two-way communication between land management agencies and the public, more direct roles of the public in fire protection are also considered desirable. One type of such fire protection alternative is the creation of "defensible space" around one's residence that may be vulnerable to wildland fire. This approach has

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been found to be successful in a number of locations (Bailey 1991). Creating "defensible space" involves pre – fire activities such as the removal or reduction of plants, trees, and shrubs in vulnerable sites, the use of special fire resistant materials in buildings, among many others. These activities serve to create transition zones designed to slow or stop fire movement prior to reaching private homes or other structures (Carree, Schnepf, & Colt 1998).

An individual, household, or community decision to actively become involved in defensible space activities may be influenced by a number of factors. Factors such as one's values as they are oriented toward wildland fire and its management, one's perceptions of the risks of wildfire to one's home and the potential outcomes of creating defensible space are among the most apparent social psychological factors influencing decisions to take protective action around one's home. Considering that one household's decision to create defensible space may influence the safety of other households nearby suggests that the wishes of other important referent groups may have an important effect on that decision. Finally, there may be a number of perceived constraints to engaging in defensible space activities that may prevent people from engaging in such activities. While not exhaustive, these represent key factors that may drive how people behave in relation to wildland fires and the protection of their homes and private property.

2. Study Purpose

The purpose of this study was to compare the perceptions that full-time and seasonal residents of north central Minnesota have about creating defensible space around their residence in the urban–wildland interface and how those perceptions influence their behavior. Objectives for the study were as follows:

Objective 1. To measure perceived outcomes of creating defensible space in the urban-wildland interface.

Objective 2. To measure attitudes, subjective norms, perceived behavior control, and behavior related to creating defensible space around one's home in the urban-wildland interface.

Objective 3. To compare the factors identified in objectives 1 and 2 between full-time and seasonal residents of the study area.

3. Theoretical Background

Given the perceptions of interest, the *theory of planned behavior* (Ajzen 1991) was the theoretical framework for the study. Figure 1 is a pictorial depiction of this theory as applied to defensible space activities.

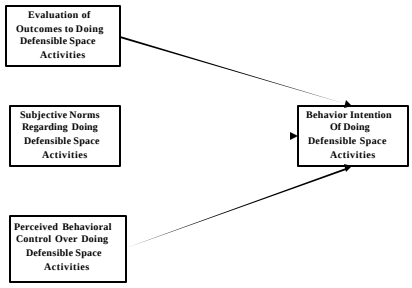

Figure 1. Application of the Theory of Planned Behavior to Defensible Space Activities.

According to this theory, the most direct predictor of an individual's behavior is his or her intention to behave in a given way. In this study, whether one actually conducts defensible space activities around his or her residence in the urban–wildland interface depends on their intention to do so.

Moving to the left in the model, three factors are suggested to directly predict intention to conduct defensible space activities. Attitudes toward the behavior are often the most prominent predictor of intention to behave. Consistent with the tenets of the theory of planned behavior, attitudes are made up of one's belief that certain salient outcomes to creating defensible space would occur as well as an evaluation of those outcomes. A second factor influencing behavioral intention is subjective norms regarding the behavior. Subjective norms are the strength of beliefs that certain important referents would want the individual to conduct defensible space activities around his or her home as well as the

individual's motivation to comply with those referents. That is, it is not enough that the individual simply agrees with the referents on the importance of doing the activities; subjective norms imply that the individual is doing the activities because the referents want him or her to do them. The third factor influencing behavioral intention is perceived behavioral control. Perceived behavioral control refers to resources and opportunities related to a given behavior. This is operationalized in this study as the ease or difficulty of creating defensible space (constraints).

The *theory of planned behavior* implies volitional behavior, but where there is a chance the behavior is not performed successfully. Applications have included health services such as regular exercise (Godin, Valois, & LaPage 1993) and weight loss (Schifter & Ajzen 1985); public services such as blood donation (Giles & Cairns 1995), water conservation (Lam 1999), and recycling (Cheung, Chan, & Wong 1999); the selection of recreation activities (Ajzen & Driver 1992); and hunting attitudes and behavior (Hrubes, Ajzen, & Daigle 2001).

4. Methods

4.1. Sampling and Data Collection

Two thousand households were selected at random from property tax information for Hubbard, Cass, Itasca and Crow Wing counties in north central Minnesota and stratified by full-time versus seasonal residence. An introductory postcard, two survey mailings, and reminder postcard were used (Dillman 2001). An overall response rate of 54% was achieved (897 returned/1,673 deliverable; full-time residents, 47%, 403/857; seasonal residents, 60%, 494/816). To test for non-response bias, a one-page survey containing three questions regarding one's attitude toward defensible space activities was sent to a random sample of 250 non-respondents (127 returned/250, 51%). No non-response bias was identified.

4.2. Questionnaire Items

Attitudes toward defensible space activities were measured consistent with the *theory of planned behavior*. Fifty residents of the Minnesota counties were contacted by telephone and asked what the most important advantages and disadvantages of engaging in defensible space activities were. The most often mentioned advantages and disadvantages were used on the survey as salient beliefs. Using 7-point Likert-type scales, respondents indicated the "likelihood" each outcome would occur as a result of doing the activities, and if each outcome was "good or bad". Attitude toward defensible space activities was the sum of the "likelihood x evaluation" products of eight salient beliefs.

Subjective norms were also identified In the telephone interview. Respondents were asked what individuals or groups would have a stake in their creating defensible space around their home. The five most often mentioned individuals or groups were included on the survey as referents. Using 7-point Likert-type scales, respondents were asked whether each of the referents would "approve or disapprove" of them creating defensible space around their home and how "important" it was to the individual to follow the desires of that referent group in this instance. Subjective norms regarding creating defensible space around one's home were measured as the sum of the "approval x importance" products across the five referent groups.

Perceived behavioral control regarding creating defensible space was measured as "barriers to creating defensible space". In the telephone elicitation survey, respondents were asked what factors existed that might prevent someone from creating defensible space around their home. The eight factors most often mentioned were included on the survey. Using a 7-point unipolar scale, respondents were asked how important each potential barrier was in influencing their decision to create defensible space around their home. "Perceived behavior control – barriers" was the mean of these eight items.

To measure *behavior* intention, using a 7-point unipolar scale, respondents were asked how likely it was that they would do each of the 12 activities around their home in the future. Behavioral intention was the mean of these 12 items.

4.3. Analyses

Full-time and seasonal residents were compared on attitudes, subjective norms, perceived behavioral control, and behavior intention related to creating defensible space using a series of MANOVAs. Regression analyses testing relationships within the *theory of planned behavior* were conducted for each residential group.

5. Results

5.1. Comparison of Resident Groups on Attitudes, Subjective Norms, Perceived Behavioral Control and Behavior Intention

We compared full-time and seasonal residents on the constructs of the *theory of planned behavior* including the likelihood and evaluation of outcomes to creating defensible space (attitude), normative beliefs and motivation to comply with those beliefs (subjective norms), perceived behavior control (barriers), and behavior intention.

There were some differences between full-time and seasonal residents on perceptions of outcomes to creating defensible space (table 1). Full-time residents believed more strongly that the activities would create nice neighborhoods, improve property appearance, and reduce home damage by fire. Seasonal residents were perceived these activities would take a lot of time, damage nature, and require cutting many trees.

	Full-time Residents	Seasonal Residents	F-value	Eta^2
Likely – Take a lot of physical effort	0.98	0.80	3.10	.004
Likely – Create a nice looking neighborhood	1.23	0.76	18.06*	.109
Likely – Damage the natural environment	-1.46	-0.18	21.49	.137
Likely – Reduce the damage to a home due to wildfire	1.51	1.11	13.92*	.096
Likely – Take a lot of time	0.63	1.69	23.31*	.148
Likely – Improve the appearance of my property	1.00	0.54	13.60*	.089
Likely – Require cutting down a lot of trees	-0.52	-0.04	12.33*	.075
Likely – Male firefighters' job easier	1.55	1.40	2.15	.003
Wilks' Lambda = .954; p < .001; Eta^2 = .156 * Difference is statistically significant at p≤ .006 (Bonferoni's adjustment)				

Table 1. Outcomes of Doing Defensible Space Activities by Residence

There were no significant differences between full-time and seasonal residents on the importance of the desires of referent individuals and groups (family, neighbors, community leaders, the Forest Service, and local fire department) regarding whether the individual conducted defensible space activities. For both groups, family m = 1.27 and 1.08 respectively) and the local fire department (m = 1.23 and 1.05 respectively) were more important than the other groups, but were only of moderate importance overall (on a scale of –3 to +3).

There was one significant difference between full-time and seasonal residents on barriers to doing defensible space activities (table 2). Seasonal residents saw "not having enough time" as a more important constraint to doing defensible space activities than did full-time residents.

	Full-time Residents	Seasonal Residents	F-value	Eta^2
I don't have enough time	-0.86	0.51	17.45*	.109
It is not practical on my property	-0.32	-0.02	5.16	.006
I don't have the physical ability	-0.55	-0.86	4.74	.006
I don't have enough money	-0.41	-0.58	1.46	.002
I don't know what kinds of activities to do	-1.14	-1.22	.375	.001
I don't know how to perform the activities	-1.22	-1.30	.398	.001
I already do some or all of these activities	1.08	0.86	3.83	.005
I think it is the fire department's responsibility to protect my home from wildfire	-2.09	-2.10	.024	.001
Wilks' Lambda = .971; p < .002; Eta^2 = .089 * Difference is statistically significant at p≤ .006 (Bonferoni's adjustment)				

Table 2. Constraints to Doing Defensible Space Activities by Residence

There were significant differences in the likelihood of engaging in some activities (table 3). Full-time residents were more likely to plant trees and shrubs 15 feet apart, maintain irrigated green areas, reduce tree density, use fire resistant plants, and serve on a committee of residents than were seasonal residents.

	Full-time Residents	Seasonal Residents	F-value	Eta^2
Likely – Clean roofs/gutters to avoid accumulation	6.14	5.84	6.66	.008
Likely – Remove dead and overhanging branches	6.04	5.75	6.75	.008
Likely – Have garden hose long enough to reach roof	6.21	5.83	3.14	.004
Likely – Use non-flammable building materials	3.25	2.95	3.79	.005
Likely – Stack wood/lumber 30 feet from house	5.26	5.24	0.02	.001
Likely – Plant trees and shrubs at least 15 feet apart	4.35	3.87	9.97*	.082
Likely – Maintain irrigated green area around home	5.60	4.60	21.59*	.195
Likely – Reduce the density of trees within 100 feet	4.57	2.81	23.19*	.207
Likely – Clear vegetation/dead leaves from property	6.02	5.71	7.46	.009
Likely – Plant fire-resistant plants such as Ivy	2.62	1.22	29.99*	.212
Likely – Plan an evacuation route from your home	5.67	5.63	0.09	.001
Likely – Serve on committee of residents	2.65	1.51	21.38*	.212
Wilks' Lambda = .917; p < .001; Eta^2 = .133 * Difference is statistically significant at p ≤ .004 (Bonferoni's adjustment)				

Table 3. Intention to Do Defensible Space Activities by Residence

5.2. Comparing Groups on the Tenets of the Theory of Planned Behavior

We conducted regressions using the *theory of planned behavior* constructs for the two groups (figure 2). The first beta in figure 2 for each relationship represents the regression for the full-time residents, while the second beta represents seasonal residents. For both groups, the most important predictor of one's intention to do defensible space activities is the evaluation of outcomes to doing those activities (our measure of attitudes). Subjective norms were also significant, yet weaker predictors of behavior intention. The difference between the two groups is found in the importance of perceived behavior control. While this factor did not influence full-time resident's intention to do such activities, it did have a significant effect on seasonal residents, and was a more important factor than subjective norms for this group.

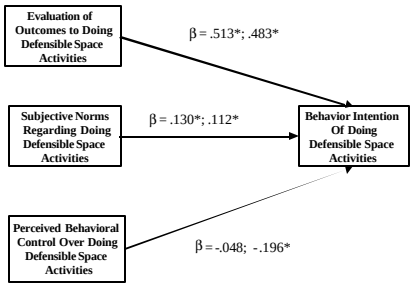

Figure 2. Test of Theory of Planned Behavior Applied to Defensible Space by Full-time and Seasonal Residents Respectively.

6. Discussion

Categorizing respondents on residence, we examined attitudes, subjective norms, perceived behavioral control, and behavioral intention regarding creating defensible space in the urban–wildland interface. Ajzen's (1991) *theory of planned behavior* was the theoretical framework underlying this effort.

6.1. Attitudes, Subjective Norms, and Perceived Behavioral Control Toward Defensible Space

While support for conducting defensible space activities around one's home in the urban–wildland interface was high for both resident groups, differences were found in the strength of specific perceptions that underlie willingness to engage in those activities. For example, full-time residents had more extreme attitudes toward engaging in defensible space activities as noted by the perceived higher likelihood of positive outcomes such as reducing fire damage to homes, enhanced aesthetic benefits of defensible space, and making firefighter's jobs easier and the perceived lower likelihood of outcomes such as damaging the environment and taking a lot of time. Having enough time to do the activities was a significantly more important barrier for seasonal residents than for full-time residents; an understandable finding given the relatively more temporary nature of one's time at a seasonal residence.

It is also instructive to examine the relative effects of these factors on the intention to created defensible space. As found a most studies that apply the theory of planned behavior (or its predecessor, the theory of reasoned action), attitudes toward engaging in a behavior is the most important factor influencing intention to engage is such behavior.

A particularly interesting finding is that the perceived control over, or barriers against, doing defensible space activities was an important factor influencing intention to do the activities for seasonal residents (more important than were subjective norms) but were not significant predictors for full-time residents.

The greater importance that seasonal residents place on the lack of time as a barrier as well as the higher correlation between barriers and behavior attention translates into the fact that full-time residents were more likely to actually engage in a number of the defensible space activities than were the seasonal residents.

6.2. Conclusion

Implications of this research lie in a greater understanding of the perceptions that constituents of land management agencies have about forest and wildland fire management as well as specific management policies and strategies. Understanding constituent perceptions through

research such as this is one component of improved integration between managers and the public called for by Cortner (1991) and associates (Cortner, Swinford, & Williams 1990).

While general support for creating defensible space in north central Minnesota was strong for both full-time and seasonal residents, this may or may not be the case in other parts of the country with similar, or greater, urban–wildland problems related to forest and wildland fire management. Also, differences in the urban-rural makeup of a region may imply differences in how residents respond to management issues (Howell & Laska 1992; Steel, List, & Shindler 1997). That different motivations appeared to drive the decision to do defensible space activities suggests that managers in areas with a diverse population may need to consider several approaches to encourage desired behaviors on the part of homeowners. Providing information about how the Forest Service or community perceived the development of defensible space is likely to fail if given to individuals for whom the wishes of these governmental groups is not a priority. In that case, information about direct effects of doing defensible activities on the personal well being of the individuals would likely be more successful. On the other hand, using information that emphasizes the broader societal benefits of an individual creating defensible space would likely work when the audience places high importance on the wishes of other individuals and groups.

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