UNIVERSITY OF WAIKATO

Hamilton
New Zealand

The Relationship between Well-Being and Wildfire

Pamela Kaval
University of Waikato

Department of Economics

Working Paper in Economics 6/14

October 2006

Pamela Kaval
Department of Economics
University of Waikato,
Private Bag 3105,
Hamilton, New Zealand

Fax: +64 (7) 838 4331
Phone : +64 (7) 838 4045
Email: pkaval@mngt.waikato.ac.nz

Abstract

In this study, the well-being evaluation method, a technique for measuring individual utility, was used to study how people in the wildland urban interface of Colorado (USA) felt about their lives before and after two hypothetical wildfire scenarios. Variables such as age, family size, fire frequency, and property value were found to affect initial well-being levels. However, if a wildfire were to occur, **many** variables that initially affected well-being were no longer significant. It was found that after wildfire, the frequency of wildfire occurrence became the most important influence on well-being. These results have several implications for wildfire managers. First, the well-being of Colorado wildland urban interface residents would be enhanced by a reduction in the frequency of high-intensity wildfires. Secondly, an extremely high percentage of respondents were in favor of prescribed burning. Therefore, the reduction of high-intensity fires could not only be accomplished by conducting a rotation of prescribed fires, but that prescribed burning would be accepted by the public living in the wildland urban interface.

Keywords
Well-being evaluation method
Colorado
Happiness
Wildland urban interface
Wildfire intensity

JEL Classification
I39, Q27, Q51

Acknowledgements

The author would like to thank John Loomis for his comments on several of the first drafts of this paper, as well as obtaining the grant for the survey work on this project. The author would also like to thank Thomas Wilding for his extensive editing assistance.

INTRODUCTION

Utility, the measure of satisfaction, well-being or happiness someone gains from a good or service, is a fundamental concept in consumer and welfare economics. Part of received economic doctrine is that each individual is the best judge of what contributes to their own utility (Morawetz et al., 1977; Frey and Stutzer, 2002; Easterlin, 1974; Dixon, 1997; Bianchi, 2004; Ng, 1997). For decades, utility has been believed to be largely unobservable, but progress has been made for inferring utility by a variety of means.

Gross Domestic Product (GDP) is a monetary measurement that represents the market value of a countries final goods and services for one year. Some economists relate the growth in GDP comparisons between countries as an indicator for the well-being of a country. If GDP increases, it is assumed that the countries utility or well-being also increases. However, this many not be correct because an increase in GDP may be offset with a decrease in leisure which in turn may decrease well-being (Ng, 2003; DiTella and MacCulloch 2000). At a more individual level, some studies have shown that an increase in income or asset value is also linked to an increase in well-being (Leu et al., 1997; Easterlin, 1974; Easterlin, 1995; Frey and Stutzer, 2002). This may also be an incorrect interpretation of well-being because a person making $35,000/year, walking to work, and living in a house next to a national park may value their life satisfaction really highly, whereas a person making $80,000/year, living in a big city, experiencing a lot of traffic on their commute to and from work and under constant job pressures may not value their life satisfaction as highly. For reasons such as these, monetizing utility is not always thought to be the best method of utility measurement.

Instead of a monetary value for well-being or utility, it has been determined that well-being is linked to happiness, one of the main goals in life (Ng, 1997; Ng 2003). Therefore, some researchers have decided to measure utility according to a happiness level. This can be done by asking people a series of questions about their lives, the results of which yields a "well-being" or "happiness" rating. Psychologists have used well-being ratings as part of their research for many years; however, economists have only used them since the 1960s (Dixon, 1997; Ng, 2003). Even now, well-being ratings are still not commonly used by economists, with only three researchers authoring the bulk of well-being studies: Yew Kwang Ng, Andrew Oswald, and Bob Frank (Dixon, 1997).

Well-being measures may be a good method to evaluate utility as they do not ask a monetary question and, as stated previously, money is not always a good indicator of utility (Ng, 1997; Dixon, 1997). Economists have used the well-being rating to create the well-being evaluation method (WBEM). The WBEM is a non-monetary way of evaluating an individuals utility by asking questions about peoples satisfaction with life or happiness (van Praag and Baarsma, 2000; Ng, 1997; Frey and Stutzer, 2002). The WBEM has its origins in the 1960s when a researcher named Cantril wanted a method of evaluating life in which the respondents could select their own satisfaction level (Cantril, 1965). This was done by placing a question alongside a picture of a ladder. The ladder represented the best and worst possible life you could have, with the top of the ladder representing the best life (step 10) and the bottom representing the worst life (step 1). The respondent could then circle the number on the ladder that they felt best represented their life. This questioning method was called the ladder of life method or the Cantril method.

Building on this approach, van Praag and Baarsma created the WBEM (van Praag, 1988; van Praag and Baarsma, 2000). To do this, they first asked respondents where they felt they were on the ladder of life scale; then they presented the respondents with a situation and asked how they would rate themselves on the well-being scale if the situation occurred. This additional information gives researchers current and after change information. Van Praag and Baarsma used the WBEM to evaluate the situation of expanding the Schiphol Airport in Amsterdam. First, they asked residents living near the airport to rate their happiness levels. They then presented the situation: an airport expansion which would increase airport noise in their neighboring community, and asked how they would rate their happiness level after airport expansion (van Praag and Baarsma, 2000).

In this study, the WBEM was used to estimate the change in utility associated with wildfire. First, respondents were asked how they currently felt about their lives. Then were then presented with two situations. The first situation was a hypothetical low-intensity wildfire occurring on the public lands surrounding their home. The second situation was a hypothetical high-intensity wildfire occurring on the public lands surrounding their home. Both situations provide the possibility of the respondents home burning. After presentation of the situations, they were asked how they felt about their lives if these fires were to occur. Research was conducted on residents in Colorado living in the wildland urban interface (WUI), within 10 miles of a public land.

APPLICATION OF WELL-BEING EVALUATION METHOD TO WILDFIRE

Pre-European settlement, low-intensity wildfires occurred once every one to 30 years in the lower elevation forests of Colorado (Larimer County, 2005; Veblen et al., 2000). Since Europeans have settled in Colorado, wildfires have been significantly suppressed. Since vegetation in the Colorado landscape evolved with frequent low-intensity wildfires, European wildfire suppression has led to a change in the ecology of the area. In very simplified terms, wildfire suppression has led to an increase in ground litter and underbrush density which has subsequently led to infrequent large acreage high-intensity wildfires. High-intensity wildfires are a problem because many people have built their homes near public lands (the WUI), which in turn means the number of homes at risk of wildfire is also large (and continually increasing as more people move into the WUI).

According to Rhodes (2003) and McCaffrey (2004), one of the key dimensions of understanding community response to wildfire risk is awareness and recognition of the wildfire risk. Do people in Colorado living close to the forest recognize this wildfire danger to their homes? Recently, Howell (2004)[i] found that 77.5% of Colorado WUI residents in Larimer and Boulder counties believe that their home is at risk of wildfire. In 2002, Higgason[ii] also studied survey responses of people in the WUI of Colorado. Higgason found 48% to 78% of respondents believed that their home was in danger of wildfire. In reality, the "actual" loss potential due to wildfire for homes in the Colorado WUI areas such as western Larimer County, where a significant portion of the study was conducted, is 57% (Larimer County, 2005). Based on the Colorado study information, it may be able to tentatively contend that perceived and actual fire risks are roughly in line with one another.

The literature gives us an understanding into the background of the natural occurrence of wildfire in Colorado and residents knowledge of wildfire, but none of these studies have looked directly at well-being type utility for wildfires in Colorado. This is what I wish to discover. I want to know how the well-being of Colorado residents living in the WUI is affected by wildfire. To study this issue in depth, I had two goals. The first was to test the hypothesis that respondents will not feel as highly about their lives after wildfire. The second was to identify important variables that affected well-being. I was especially curious to know if the same variables would affect well-being before and after wildfire, as I believe this knowledge could help wildfire managers to understand the publics view of wildfire and decide accordingly on how to manage wildfire lands. Not only this, but by using the WBEM instead of a monetary method, I hope to show that non-monetary methods are a good process to use in future economic research.

MODEL SPECIFICATION

To estimate individual utility, the well-being evaluation method was used. Questions asked were variants of the Cantril ladder of life question as well at the Van Praag and Baarsma well-being evaluation questions (Cantril, 1965; van Praag, 1988; van Praag and Baarsma, 2000). Using this questioning method, well-being was rated on a life satisfaction scale of zero through ten where zero represented the lowest possible life satisfaction and 10 represented the highest possible life satisfaction:

> *On a scale from zero to ten, where zero is very unhappy with your life and ten is the best possible life, how would you rate your satisfaction with your life? Please circle the appropriate number.*
>
> *0 1 2 3 4 5 6 7 8 9 10*
>
> ←----------→
>
> *Lowest Life Satisfaction* *Highest Life Satisfaction*

Therefore, the well-being variable is an ordinal and ordered variable.

Respondents were asked to rate their well-being under three different scenarios: the first was at the time of the survey, the second after a hypothetical low-intensity wildfire in their area, and the third after a hypothetical high-intensity wildfire in their area. While it would have been ideal to get information from people before and after actual low-intensity and high-intensity wildfires occurred in their area, this information would be more difficult to obtain and would take more time. Not only that, but it would be rare that both a low-intensity and high-intensity wildfire would occur near a person's home in a relatively close period of time. Therefore, respondents were presented with hypothetical situations. This was felt to be a valid assumption since Colorado residents hear about wildfires frequently because wildfires occur in Colorado every year.

Since well-being can only represent the numbers from 0 through 10, it is seen that:

$$
\begin{aligned}
WB = \quad & 0 \text{ if } WB^* \leq \gamma_1 \\
& 1 \text{ if } \gamma_1 < WB^* \leq \gamma_2 \\
& 2 \text{ if } \gamma_2 < WB^* \leq \gamma_3 \\
& 3 \text{ if } \gamma_3 < WB^* \leq \gamma_4 \\
& 4 \text{ if } \gamma_4 < WB^* \leq \gamma_5 \\
& 5 \text{ if } \gamma_5 < WB^* \leq \gamma_6 \\
& 6 \text{ if } \gamma_6 < WB^* \leq \gamma_7 \\
& 7 \text{ if } \gamma_7 < WB^* \leq \gamma_8
\end{aligned}
$$

$8 \text{ if } \gamma_8 < WB^* \leq \gamma_9$

$9 \text{ if } \gamma_9 < WB^* \leq \gamma_{10}$

$10 \text{ if } \gamma_{10} < WB^*$

Where WB represents the well-being variable and γ_i represents the cut-off points or threshold variables. This preserves the ordering such that $WB_1 < WB_2 < WB_3 < \ldots WB_{10}$ since the difference between a well-being of 1 and a well-being of 2 may not be the same as the difference between a well-being of 8 and a well-being of 9. This reflects the ordinal nature of the variable.

Since the data is an ordinal ranking, the most appropriate method to use in the analysis is an ordered probit model. According to Sy et al. (1997), there are two distinct advantages to using the ordered probit model over an ordinary least squares (OLS) regression in this situation. The first is that the heteroskedasticity problem that would normally arise when performing a regression on a discrete dependent variable is eliminated (Sy et al., 1997; Aldrich and Nelson, 1984). The second is that the maximum likelihood estimates are asymptotically normal, asymptotically efficient, and consistent under general conditions (Sy et al., 1997; Judge et al., 1988).

The basic ordered probit model for well-being used in this study at the current time period is $WB^* = \beta x_i' + \varepsilon_i$ where $\varepsilon \approx N(0,1)$

The dependent variable, well-being (WB), depends on the explanatory variables X_i such as age and family size. The error term, ε_i, is independent and randomly distributed with a mean of zero. This is the basic format followed in the analysis.

DATA COLLECTION

To test the hypothesis and discover which variables would be affected by the publics perception of wildfire, a survey was conducted. The survey focused on the public that lives in the WUI as these are the people that would be affected most directly by wildfire. The data was collected in a phone-mail-phone survey. The phone-mail-phone survey was a three step process. First, potential respondents were called and asked if they would complete a survey. If they said yes, a follow up phone interview was scheduled for one week following the initial phone conversation and a survey including a $10 incentive was mailed to them the following day. This would be enough time for the respondent to receive and review the survey prior to

the follow-up call. During the follow-up call, interviewers went through all survey questions with the respondent and all results were recorded and later placed in a database for analysis.

The survey used in this study, "Managing Fires on Public Lands: What Do You Think?" was created, tested in focus groups, revised, pre-tested, re-revised, and then distributed. The finalized survey encompassed eight pages of questions including general wildfire questions, well-being questions and demographic questions. One hundred and fifteen survey participants in WUI communities located within ten miles of a forest (undeveloped wildland) were contacted randomly by phone during the summer of 2001 and asked to participate in the survey. Of the 115 people contacted, 103 agreed to do the survey, while 12 did not. Of the 103 that agreed to complete the survey, 99 people followed through. Therefore, the response rate of all contacted people was 86% and the response rate of those contacted that said they would complete the survey was 96%.

Respondents were found to have an average age of 48, have completed college, and have between 2 and 3 people living in the home. Average household income was $68,000. Half of the respondents were female and 94% were Caucasian. Property values ranged from $78,000 to nearly $1.5 million, with an average of $316,000. Property values were obtained from corresponding county agencies (Table 1).

Table 1: Survey Respondent Demographic Characteristics

Variable	Mean	Median	Maximum	Minimum	Standard Deviation
Age	48	50	80	18	17.08
Ethnicity (% Caucasian)	94%				
Years of Education	16	16	21	11	2.87
Number of People Living in Home	2.3	2	8	1	1.21
Household Income (In 2001 US$)	$68,000	$55,000	$350,000	$10,000	$66,505
Sex Ratio (% Female)	50%				
Property Value	$316,263	$271,100	$1,495,000	$78,500	$187,194

As the sample size was not extremely large, the demographic variable information was compared with information from the 2000 U.S. Census (U.S. Census, 2000) to see if the sample represented the population being analyzed. Variables analyzed included sex, household size, ethnicity, age, and income. Because the sample was a subset of Colorado residents that live in the WUI, respondents were compared with the locations in which they were from: Masonville, Pagosa Springs, Estes Park, Nederland, and Red Feather Lakes (Table 2) instead of using the entire state as a general comparison.

Table 2: Survey Respondent and Census Demographic Comparisons

	Sex (% Female)	House-hold Size	Ethnicity (% Cauc-asian)	Age	Income
Nederland 2001 Survey	29%**	2.3*	94%*	48***	$62,500**
Nederland 2000 Census Data	46%	2.3	97%	33	$50,588
Estes Park 2001 Survey	37%**	2.4*	96%*	53***	$82,037**
Estes Park 2000 Census Data	52%	2.1	95%	45	$43,262
Pagosa Springs 2001 Survey	77%**	3.2*	88%*	51***	$77,777***
Pagosa Springs 2000 Census Data	51%	2.5	75%	37	$29,469
Masonville[1] 2001 Survey	44%*	2.4*	87%*	31*	$70,217**
Masonville[1] 2000 Census Data	50%	2.5	90%	28	$44,459
Red Feather Lakes 2001 Survey	81%**	2.2*	100%*	62*	$35,500*
Red Feather Lakes 2000 Census Data	51%	2.0	97%	54	$33,527

*99.00%, **99%, and ***95% Confidence Intervals

[1] Masonville was not considered a town by the census bureau. Therefore, Fort Collins was used to represent Masonville, as it was considered to be part of Fort Collins in the 2000 Census

From these comparisons it was found that the survey respondents demographics matched up closely with the demographics of the areas in which they were from, with over 95% confidence level significance for all variables. Therefore, while the sample size was only 99, the results are still believed to be valid as the population of respondents matches closely with the actual wildland interfaces they lived in.

RESULTS AND DISCUSSION

The survey consisted of general wildfire background information, well-being information, and demographics. General questions included how close homes were located to public lands, whether they felt their home was in danger from wildfire, whether they used the lands surrounding their home for some type of activity, and if so, which activities. They were asked if they would still visit the lands they currently visit if a wildfire were to occur there. They were also asked which fire management techniques they prefer.

All of the respondents (100%) live in the WUI within 10 miles of a public land, while 34% of respondents property borders public lands. When asked about their use of public lands, it was found that 99% of respondents visit the public lands surrounding their home. However, they use these lands for several different activities, the most popular being hiking or walking (94%), scenic driving (88%), and wildlife viewing (85%).

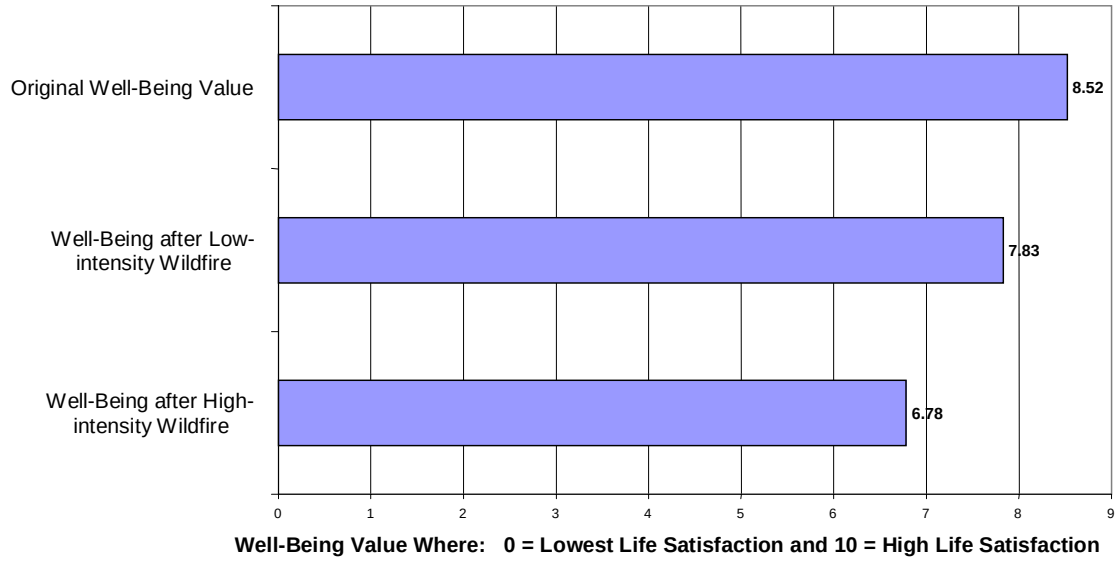
If a wildfire were to occur on the public lands they currently use, 31% said they would still visit the lands, 29% said they will visit the land after the area recovers, 26% said they would still visit the lands, just less often, 1% said they would visit more often, 5% said they would not go and 7% did not answer the question.

As suggested by Rhodes (2004) and McCaffrey (2003), respondents were asked if they felt their home was in danger of wildfire. Here, it was found that 61% of them felt their home was in danger of wildfire. This also corresponds with the Howell and Higgason studies conducted after the study as well as the actual fire danger rates for people in the WUI (Higgason, 2002; Howell, 2004; Larimer County, 2005). Therefore, perceived and actual fire risks for the Colorado WUI respondents are roughly in line with one another. When asked what fire management scheme they would like fire managers to use on public lands, over 86% said they were in favor of prescribed fires.

General questions were followed by the three well-being questions: the first at the current point in time, the second after the hypothetical low-intensity fire and the third after the hypothetical high-intensity fire. The mean overall response to how people currently feel about their life currently on the 0 to 10 well-being scale (where 0 is the worst possible life and 10 are the best) was 8.523. This was the base level. This is similar, although slightly higher, to the Frey and Stutzer report that people living in the United States have an average happiness ranking of 8.437[iii] (Frey and Stutzer, 2002). It is believed that this shows that Colorado WUI residents are generally happy with their lives and perhaps even happier than the average United States resident.

Respondents were then asked to rate their happiness level after a low-intensity wildfire and after a high-intensity wildfire in their area (Figure 1). A low-intensity wildfire was defined as a fire in which underbrush was burned but most standing trees were not. A photograph of a ponderosa pine (*Pinus ponderosa*) forest in Colorado one year after a low-intensity burn was included to use with this question. The low-intensity fire picture theoretically represents the typical prescribed fire that would occur if prescribed burning were to be used on a rotation that was similar to the fire frequencies that occurred in Colorado prior to European settlement. A photograph of a ponderosa pine forest one year after a high-intensity wildfire was included to use with the high-intensity wildfire well-being question. In this picture, all vegetation was burned and only standing dead trees, very black in color, were left. Forests in both of the photos were similar in stand density (trees per hectare) and tree size (d.b.h. – diameter at breast height). They represented the typical public land that would be near respondents homes.

Figure 1: Average Well-Being Values



If a low-intensity wildfire occurred in their area, their well-being level decreased from 8.523 to 7.830, a significant 0.7 point change (ANOVA, p=0.005). After high-intensity wildfire, their happiness level decreased from the original 8.523 to 6.784, an approximately 1.7 point change (ANOVA, p=0.000). These results show that people living in homes near public lands in Colorado feel pretty good about their lives. If a low-intensity or high-intensity wildfire were to occur, they would still feel good about their lives, just not as good as prior to the fire. A one way ANOVA test showed that these values were statistically different at the 99.99% level (ANOVA, p=0.000).

To understand the relationship between well-being and other variables, an ordered probit regression was used (Table 3). Variables believed to have an effect on well-being included family size, infrequency of fire, property value and age. Family size represented the number of people living in the home that the reported annual income supports – values ranged from a family size of one through a family size of 8 with an average of 2.3. It is believed that the relationship between family size and well-being would not be a linear relationship because the more people living in the home, the higher they might perceive their risk to be as they not only have to worry about themselves, but also about all the others in the home. For this reason, both family size as well as family size squared were used. Fire infrequency represents how often the respondent believes that a high-intensity wildfire occurs in their area. If they believe a fire occurs once a year, this value would be "1," if it was twice a year, the value would be "0.5," and if it was once every 20 years, the value would be "20." Property value was the value of the property including the home. These data were obtained from the respective county offices. Property value was also perceived to have a non-linear

relationship, so both property value as well as property value squared were included. The final variable was age. This simply represented how old, in years, the respondent was.

Table 3: Ordered Probit Results
(With Significant Results in Bold)

Well-being Equations	Family Size	Family Size^2	INFreq	Property	Property^2	Age
1. Current Well-being Rating (Probability)	**-1.057** **(0.008)**	**0.128** **(0.030)**	**0.015** **(0.053)**	**4.63E-06** **(0.014)**	**-3.50E-12** **(0.007)**	**0.025** **(0.004)**
2. Well-being after Low-intensity Fire (Probability)	-0.207 (0.534)	-0.003 (0.945)	**0.024** **(0.002)**	**3.06E-06** **(0.095)**	**-2.40E-12** **(0.057)**	0.003 (0.709)
3. Well-being after High-intensity Fire (Probability)	0.079 (0.811)	-0.020 (0.648)	**0.025** **(0.001)**	**7.74E-06** **(0.004)**	**-8.25E-12** **(0.004)**	0.002 (0.821)

Equation 1 represents the current well-being or happiness level. In Equation 1, it was found that the size of the family has an influence on the happiness level. In particular, this shows that as the size of the family increases, the level of well-being decreases at an increasing rate. The next variable of interest was fire infrequency. In this equation, it was found that as the infrequency of the fire increases, well-being increases. For example, if they believed that a fire occurred once every 9 years and it will now only be occurring once every 10 years, wildfire occurs less frequently and their happiness level would increase. The property value is significant and indicates that as the value of the home or property increases, well-being also increases. This becomes more evident in homes over $500,000 in value. However, the corresponding coefficient on property is only 4.63E-06 and on property^2 is only -3.50E-12. Even though the property value is in the thousands of dollars, the change to well-being would have a miniscule although significant effect on well-being. This shows that property values do have an effect on well-being which does correspond with past research showing that the more money you have the happier you are, but, it also shows that the amount that it contributes to well-being is fairly insignificant. While this does show the previous economic literature is correct, it also shows that other variables have a much higher contribution to well-being, another reason that perhaps increasing well-being should be more important than increasing monetary values such as GDP or incomes. Age is the final variable in the equation, and here it can be seen that as age increases, so does the well-being rating. From this equation, it can be seen that on an average day in the life of a Colorado WUI resident, their level of well-being is affected by many variables. The same variables were used in all three of the equations.

Equation 2 represents well-being after a hypothetical low-intensity fire occurred in their area. Here, it was found that after a hypothetical low-intensity wildfire, family size, and age are no longer significant. However, the infrequency of fire is significant showing that as the infrequency of fire increases, the well-being increases. This result is more significant in Equation 2 than in Equation 1 (originally p=0.053 to p=0.002 now) and it has more weight (originally 0.015 to 0.024 now). Property value is also significant showing that as the property or property value increases, so does well-being. Again, this is a small contribution.

Equation 3 represents well-being after a hypothetical high-intensity wildfire in their area. In this equation, family size and age were not significant. Property value remains significant (but a small contribution), and, as in Equation 2, wildfire infrequency is again significant. Wildfire infrequency is more significant here than in any of the other Equations (p=0.001 as compared to p=0.002 or p=0.053) and is weighted slightly higher (0.025 as compared to 0.024 or 0.015).

Overall, it can be seen that the frequency of wildfire and, to a lesser degree, property value, became the most important variables after wildfire, while other characteristics dropped out of the importance range. Wildfire is a significant life event, and while this has not been studied alongside the concept of wildfire before, Clark and Oswald, 2002, and Blanchflower and Oswald, 2000, also found that significant life events have an effect on well-being levels; from studies of events such as marriage and unemployment.

CONCLUSIONS

In this study, the hypothesis that wildfire would have an effect on well-being were tested. At the same time, specific variables that were believed to have the potential to affect well-being were analyzed. As the study was looking at viewpoints of people that had a greater than average risk of their home burning in a wildfire, the study respondents selected were Colorado wildland urban interface residents. Overall, at the current point in time, it was found that these respondents felt pretty highly about their lives, perhaps even higher than the average American. When presented with the situation of a wildfire, it was found that if a hypothetical low-intensity or high-intensity wildfire were to occur in the area in which they live, their well-being would decrease. This was found to be more-so with the high-intensity fire than the low-intensity. This result was expected as wildfire is not only a significant life event, but it is also a natural hazard comparable to earthquakes, hurricanes, cyclones, and floods. In Colorado, this is an extremely important issue for two reasons: because more

people are moving into the WUI and therefore increasing the risk of a home burning, and that global climate change research shows that wildfires will become more common than normal with the temperature changes.

Ordered probit regression results show that several variables were important to individual well-being: age, family size, property value, and frequency of fire. But, the results also show that if a wildfire, a significant life event, occurs, many variables that would normally influence well-being, no longer do. After wildfire, wildfire frequency and property value became the only significant variables. While the results show that as property value increases, well-being also increases, is consistent with economic literature, the value of the increase in well-being from an increase in property value is so small that the overall increase in well-being is minimal. Therefore, the data concurs with some of the literature that says that monetizing utility may not be the best method of utility measurement and because of this belief, the well-being measurement method may be a useful method for economists interested in estimating non-monetary measures of the change in utility associated with changes in environmental conditions.

Regression results showed that the most important variable in determining well-being after a wildfire was frequency of fire. Therefore, perhaps wildfire managers should focus on reducing the chances of a high-intensity wildfire occurring by reducing the frequency of high-intensity wildfires by restoring Colorado's ecology to that of pre-European times. In pre-European times, frequent low-intensity fires occurred, which reduced the chances of high-intensity fires. Because over 86% of respondents believe that prescribed fires are a good management tool to use, wildfire managers could potentially use prescribed fires to try to restore the native Colorado fire regimes as the public is in support of this. This could have a dual effect of decreasing the frequency of high-intensity wildfires and increasing the well-being of Colorado wildland urban interface residents.

REFERENCES

Aldrich, J.H., and Nelson, F., 1984, *Linear Probability, Logit, and Probit Models*, London: Sage publications.

Bianchi, M., 2004, *If Happiness is So Important, Why Do We Know So Little About It?* Working Paper.

Blanchflower, D.G. and Oswald, A.J., 2000, *Well-Being Over Time in Britain and the USA*, Working Paper.

Cantril, H, 1965, *The Pattern of Human Concern*, Rutgers University Press: New Brunswick, New Jersey.

Clark, A.E. and Oswald, A.J., 2002, *A Simple Statistical Method for Measuring How Life Events Affect Happiness*, International Journal of Epidemiology, 31, 1139-1144.

DiTella, R., and Macculloch, R., 2000, *Partisan Social Happiness*, Paper presented at the Economics and Happiness Conference, Nuffield College, Oxford.

Dixon, H.D., 1997, *Controversy: Economics and Happiness*, The Economic Journal, 107, 1812-1814.

Easterlin, R.A. 1995, *Will Raising the Incomes of All Increase the Happiness of All?* Journal of Economic Behavior and Organization, 27, 35-47.

Easterlin, R.A, 1974, *Does Economic Growth Improve the Human Lot? Some Empirical Evidence*, In "Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz," Academic Press, New York, NY, pp. 89-125.

Frey, B.S. and Stutzer, A., 2002, *What Can Economists Learn from Happiness Research?* Journal of Economic Literature, 40, 402-435.

Higgason, C.L., Fall 2002, *A Community Level Process for Adoption of Wildfire Mitigation Programs in the Wildland-Urban Interface of Colorado*, Masters Thesis, Department of Forest Sciences, Colorado State University, Fort Collins, Colorado.

Howell, S., Summer 2004, *Valuation of Forest Fuels Treatment Programs in Colorado: A Comparison of Urban and Wildland-Urban Interface Residents*, Masters Thesis, Department of Forest, Rangeland, and Watershed Stewardship, Colorado State University, Fort Collins, Colorado.

Judge, G., Griffiths, W.E., Hill, R.C., Lutkepolh, H., and Lee, T.C., 1988, *Introduction to the Theory and Practice of Econometrics,* Toronto: John Wiley & Sons.

Larimer County, 2005, *Is Wildfire Really a Problem in Larimer County?* www.co.larimer.co.us/wildfire/wildfire_really_problem.htm

Leu, R.E., Burri, S., and Priester, T., 1997. *Lebensqualitat und Armut in der Schweiz*, Bern: Haupt.

McCaffrey, S., 2004, *Thinking of Wildfire as a Natural Hazard, Society and Natural Resources*, 17, 509-516.

Morawetz, D., Atia, E., Bin-nun, G., Felous, L., Gariplerden, Y., Harris, E., Soustiel, S., Tombrow, G., and Zarfaty, Y., 1977, *Income Distribution and Self-Rated Happiness: Some Empirical Evidence*, The Economic Journal, 87, 511-522.

Ng, Y.K., 2003, *From Preference to Happiness: Towards a More Complete Welfare Economics*, Social Choice and Welfare, 20, 307-350.

Ng, Y.K., 1997, *A Case for Happiness, Cardinalism, and Interpersonal Comparability*, The Economic Journal, 107, 1848-1858.

Rhodes, A., 2003, *Understanding Community Preparedness and Response to Wildfire Risk*, Australian Disaster Conference. National Convention Centre, Canberra, Australia, 10-12 September.

Sy, H.A., Faminow, M.D., Johnson, G.V., and Crow, G., 1997, *Estimating the Values of Cattle Characteristics Using an Ordered Probit Model*, American Journal of Agricultural Economics, 79(2), 463-476.

U.S. Census Bureau, 2000, *Results from the 2000 Census,* www.census.gov.

van Praag, B.M.S, 1988, *Climate Equivalence Scales – An Application of a General Method*, European Economic Review, 32, 1019-1024.

van Praag, B.M.S. and Baarsma, B.E., 2000, *The Shadow Price of Aircraft Noise Nuisance: A New Approach to the Internalization of Externalities*, Tinbergen Institute Discussion Paper, T1 2001-010/3.

Veblen, T.T., Kitzberger, T., Donnegan, J., 2000, *Climatic and Human Influences on Fire Regimes in Ponderosa Pine Forests in the Colorado Front Range*, Ecological Applications, 10(4), 1178-1195.

FOOTNOTES

[i] This study was conducted after the data was already collected.

[ii] This study was also conducted after the data was already collected.

[iii] In Frey's report, rankings were based on a scale of 1 through 10. Frey's reported average happiness ranking was 7.67. By converting 7.67 to the scale of 0 through 10, a ranking of 7.67*1.1=8.437 was obtained.