

**Climate Change and Public Perception of the
Proposed Fire Risk Mitigation in Berkeley, California's Strawberry Canyon**

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ABSTRACT

The effects of global climate change are manifest in local and regional outcomes such as rising sea levels, extreme weather events and the melting glaciers in polar and alpine regions. However, the relationship between climate change and local environmental issues is often difficult to document or demonstrate scientifically, and the public is often uncertain and confused about the nature of such relationships. This study analyzes how perception of climate change influence perception of local management issues such as Strawberry Canyon. In a survey of over 300 students at the University of California, Berkeley, a strong majority of respondents were uncertain as to whether a local fire mitigation project on the university campus in Strawberry Canyon was directly related to climate change. Students widely supported localized policy as a means of effectively mitigating climate change, however they generally did not see the proposed fire mitigation plan as a means of mitigating environmental problems and risks associated with climate change. Although most students had well-developed risk perception of both the impacts of the Strawberry Canyon fire mitigation proposal and of climate change, most students demonstrated uncertainty when asked if the risks associated with the Strawberry Canyon fire mitigation proposal were directly related to climate change. This study addresses the largely unstudied dynamics of public perceptions regarding climate change and local environmental issues. This is critical in understanding the political viability of localized climate change policies as part of broader and much needed national and international climate change policy frameworks.

KEYWORDS

risk perception, forest management, eucalyptus, wildfire, public opinion

INTRODUCTION

The effects of global climate change are manifest in local and regional outcomes such as rising sea levels, extreme weather events and the melting glaciers in polar and alpine regions. However, the relationship between climate change and local environmental issues is often difficult to document or demonstrate scientifically and the public is often uncertain and confused about the nature of such relationships. Fire ecologists and others have recently argued that the greater frequency of wildfires in California and throughout western North America, Australia, and elsewhere in recent years is clearly associated with climate change (Fried 2004 Scholze 2006 Stephens 2007). Warmer and dryer forest ecosystem conditions in many areas of California have articulated with historical fire suppression policies and residential development in areas at risk for wildfire, creating conditions in which wildfire intensity and severity have increasingly threatened urban and exurban residential areas (Tompkins 2004 and McKenzie 2004). Wildfires in the United States cost over \$900MM per year and destroyed more than 9,000 homes between 1985 and 2003. This is likely to be exacerbated by climate change, for instance California's population density and housing development increases at the wildland-urban interface, bringing new challenges in fire-management (Fried 2004). Yet there has been little research on risk perception, subjective judgment about the characteristics and severity of specific risks, concerning local urban ecosystem management policies designed to ease adaptation and maintain resilience in the face of climate change.

The complex science of climate change, along with politically motivated efforts to discredit climate change science and deny or downplay the existence and effects of climate change, has caused misperception by the public and resulted in many failed attempts to develop a successful and effective political regime for mitigating climate change at local, national and global scales (Leiserowitz 2008). Public perception and opinion has a profound influence on public policy and plays a critical role in the government's responsiveness to issues of concern to the public (Shapiro et. al 2000). Research on how public opinion influences national policy in the U.S. found that in sixty three percent of the cases that were studied, policy was constructed and shaped around the majority opinion of the general public (Monroe 1998 and Erickson 2002). This is significant in understanding the dynamic relationship between public opinion and public policy. For example, it was not until the public pushed for government regulation on nitrous oxide emissions in response

to the ozone depletion crisis that action was taken by policy makers (Shapiro 2000). Another important study found that policy changed in congruency with public opinion (Page 1983). Thus, public opinion may be an important foundation for effective climate change policy at the state, regional, metropolitan and local levels (Rosenzweig 2010 and Schreurs 2008).

Climate change did not receive national attention from the public until 1988, when NASA scientist Dr. James Hansen testified before Congress that anthropogenic pollutants were altering Earth's climate (Christianson 1998). Since 1988, concern about and awareness of climate change has increased in the U.S. and internationally (Leiserowitz 2008). More recently, concern about climate change has increased and the number of individuals who are unsure of human influence on climate change has decreased (Leiserowitz et al. 2010). However, economic growth, health care, terrorism, and other issues continue to be perceived by the American public as more important than climate change (Upham et al. 2009). More importantly, while the public has increasingly come to accept that climate change is occurring, uncertainty remains about the nature of specific impacts of climate change (Poortinga et al 2011). This uncertainty can affect one's ability to adapt to climate change, which depends on and is limited by social and individual factors such as risk perception, social status and knowledge (Adgar 2009). Public risk perception can fundamentally compel or constrain political, economic and social action to address particular risks for example, public support or opposition to climate policies will be greatly influenced by public perceptions of the risks and dangers of global climate change (Lorenzoni 2006 and Leiserowitz 2008). Yet there is little research on the relationship between perceptions of climate change and risk perception concerning localized mitigation and management policies to foster better-informed decision-making on climate change policy.

UC Berkeley, the City of Oakland, and the East Bay Regional Park District applied for financial assistance through a federal Pre-Disaster Mitigation Program in May 2013 to implement "hazardous risk reduction" projects in the East Bay hills. This grant would fund four separate projects in Strawberry and Claremont Canyon however, for the purposes of this study, projects related to Strawberry Canyon will be the main focus. The main objective of the grant proposal is to remove thousands of non-native trees such as eucalyptus (*Eucalyptus globulus*, *Mrytacea*), monterey pine (*Pinus radiata*, *Pinacea*) and bay laurel, (*Umbellularia californica*, *Lauracea*) that pose a high fire risk to these areas (Tayloy 2013). The grant proposal is described as a "fire mitigation management plan" designed to "substantially reduce hazardous fire risk to people and

structures in the East Bay Hills” and prevent costly and devastating wildland-urban fires such as the Oakland/Berkeley fire of 1991, which was the third costliest fire in U.S. history and caused \$2 billion in insured losses (FEMA 2013 and Fried 2004). In order to process the joint application, FEMA has released a draft Environmental Impact Statement, which states that the Strawberry Canyon fire risk mitigation plan is needed to address the “severity and repetitive nature of wildfires in the East Bay Hills area and the proximity of residential areas to open spaces that are susceptible to fires” (FEMA 2013). The draft Environmental Impact Statement reports that the “reduction of hazardous fire risk would reduce the need for future disaster relief and the risk of repetitive suffering and damage” (FEMA 2013). As climate change continues to heighten the threat of wildfires in California, mitigating the potential and often unpredictable impacts of climate change grows more and more critical.

Action to adapt and maintain ecological and social system resilience in the face of climate change requires adjustment by governments, individuals and society as a whole. The dynamic and complex nature of climate change science and the complexity of causes, processes and outcomes associated with climate change globally and locally underpin misconceptions about the risks, impacts and threats that it poses to the public. Due to the politically charged nature of climate change discourse, it is important to recognize the influence of public opinion on policy. The relationship between climate change and local environmental issues is often difficult to document or demonstrate scientifically, and the public is often uncertain and confused about the nature of such relationships. One important dimension of this is how perception of climate change influence perception of local management issues such as Strawberry Canyon. This study analyzes how knowledge, attitudes and opinion of climate change influence perception of local management issues such as Strawberry Canyon to gain a better understanding of the lack of perceived linkages between global and local impacts of climate change, and the implications locality has for policy development. Understanding this largely unstudied dynamic is critical in understanding how public attitudes, knowledge, and risk perception influences the public’s opinion on comprehending the complexities climate change plays in their daily lives. Grasping how the public influences small-scale localized climate change policy, management, and mitigation could help develop and shape the much-needed national or international climate change policy framework to address the unavoidable impacts climate change poses in this anthropogenic era. Global changes in climate, environment, economies, populations, governments, institutions, and cultures converge in

localities. Changes at a local scale, in turn, contribute to global changes and as a result, across a broad range of disciplines and problems, linking local and global scales potentially yields deeper understandings of global climate change in all its complexity (Wilbanks 1999).

METHODS

Study System

The proposed projects include the removal of approximately 80,000 (22,000 in Strawberry Canyon) non-native trees (Fig.1). This will include chipping cut trees, and leaving many of the chips in place for sediment and invasive weed control (Fig.2). The agencies would apply herbicides to the cut stumps to prevent resprouting. Additionally, they may reuse large logs to control erosion on slopes and, in some areas, thin or remove native vegetation such as coyote brush. Also, burning techniques may be used on cut brush and branches assimilated in piles and may use control measures such as grazing or herbicides to the cut stumps to prevent resprouting.

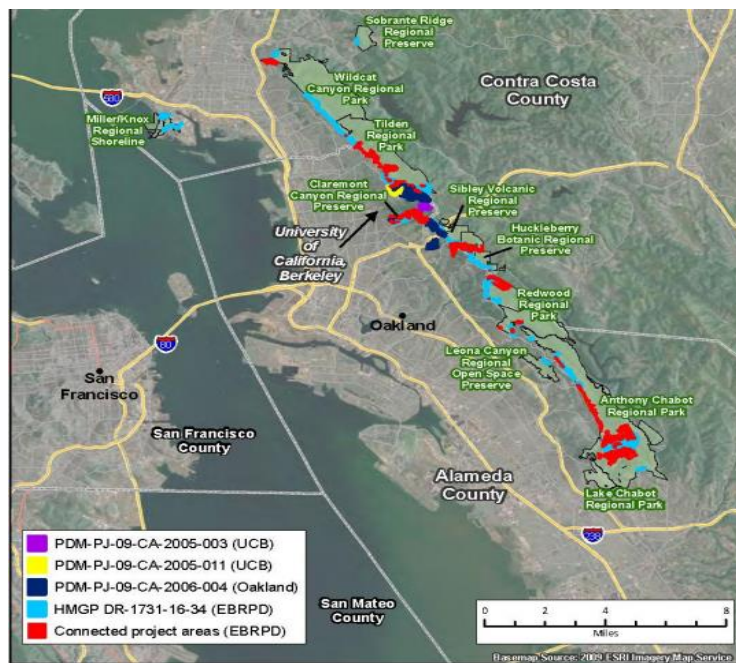


Figure 1. East Bay Hazardous Fire Risk Reduction Project. About 1000 acres of proposed and connected project areas in the East Bay Hills.

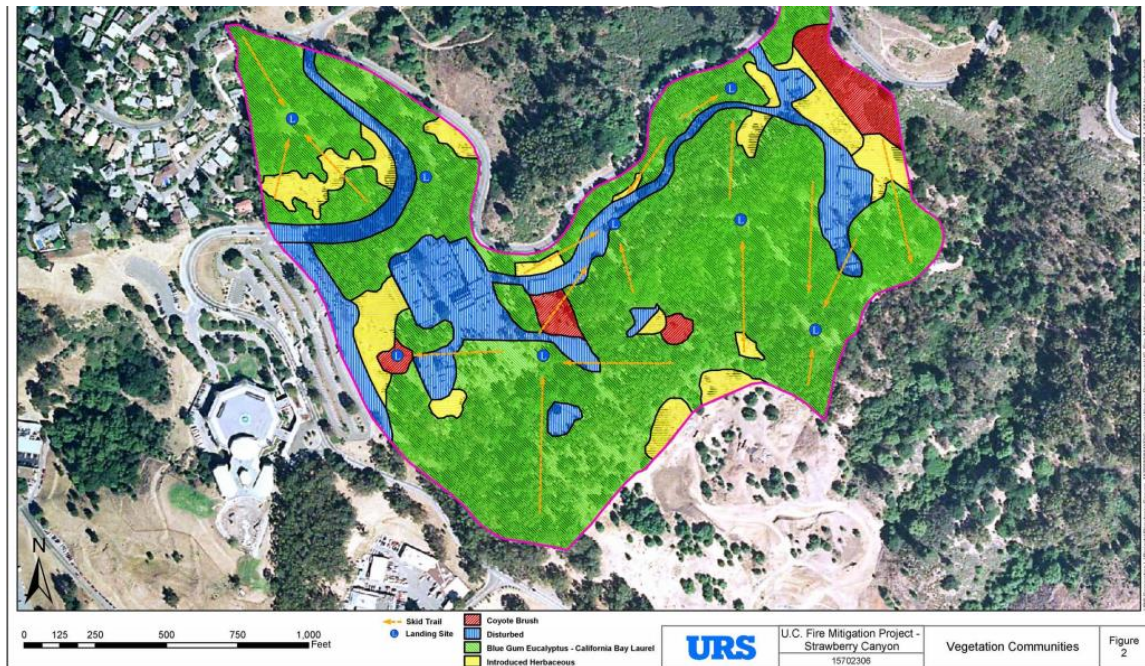


Figure 2. Fire Mitigation Proposal in Strawberry Canyon. Approximately 56.3 acres of non-native vegetation will be removed in Strawberry Canyon located near the UC Berkeley campus.

Study Design

To assess how student risk perception of climate change is correlated to the perception of the proposed fire risk mitigation of Strawberry Canyon, I surveyed 301 students' on their opinions about the forest management issues in Strawberry Canyon on whether students perceive the fire mitigation proposal in Strawberry Canyon as a climate change related issue and seeking to determine if any demographics, such as college major or education level, influenced certain opinions. I had two survey populations, the first consisting of 136 freshmen from the Fall Program for Freshmen (FPF). FPF is a partnership between UC Berkeley and UC Berkeley Extension, which allows newly admitted freshmen to start their undergraduate studies during the fall semester off campus and transition to Cal in the spring. The second survey population consisted of seniors, juniors and sophomores all from the main campus. This also involved generating questions that assessed student perception, knowledge and attitudes regarding climate change and Strawberry Canyon. I collected my data from students enrolled in Environmental Science, Policy, and Management 50AC, Introduction to Culture and Environmental Management, at UC Berkeley in Fall 2013. It has a broad representation and diverse composition of students on campus. The class consists of majors other than natural sciences such as Business, Political Science and English, as

well as has a range of freshman, sophomores, juniors and seniors. The combination of convenience and having access to an ideal student population on campus allowed for the distribution of my survey to be efficient and a timely process.

Data Collection

To collect data on how student risk perception associated with climate change influences student perception of the Strawberry Canyon fire mitigation proposal, I used surveys to gain better insight as to how students perceive Strawberry Canyon and climate change. I surveyed 301 students through an online survey using the Qualtrics platform to determine if their risk perception of climate change influenced their perception of the proposed fire mitigation in Strawberry Canyon. The survey consisted of twenty questions (Appendix), and included questions about demographics, student knowledge, attitudes and perception of climate change and Strawberry Canyon. Demographic questions focused on race, ethnicity, education level, age, income, hometown and gender. This data allowed for me to disaggregate my population and identify any trends amongst these categories, particularly in terms of how opinions, perceptions, attitudes and knowledge vary between groups. Second, I asked questions concerning respondents' familiarity with and opinions of the proposed management practices in Strawberry Canyon. I asked students to identify the risks, impacts and alternative forest management practices that could potentially be used in Strawberry Canyon. These questions also provided information on whether students saw the proposed forest management plan in Strawberry Canyon as an adaptation mechanism for climate change. Finally, I asked questions concerning respondents' attitudes, perception and knowledge of the causes, risks and impacts of climate change.

Data Analysis

I used statistical analysis to assess the relationship and association between public opinion, attitudes and knowledge on Strawberry Canyon and public opinion, attitudes and knowledge on climate change. I used categorical measurements as well as by using basic statistical functions in excel to preform analyses such as regression and chi squared. I focused on four main themes: attitudes and knowledge of Strawberry Canyon, public opinion and perception of Strawberry

Canyon, attitudes and knowledge of climate change and public opinion, and perception of climate change.

Attitudes and Knowledge Concerning Strawberry Canyon

To assess how student attitudes and knowledge of the Strawberry Canyon fire mitigation proposal influenced their perception of Strawberry Canyon, I asked students how familiar they were with the proposed fire mitigation management plan for Strawberry Canyon. I also asked respondents to identify the possible impacts the proposed fire mitigation plan may have on the surrounding environment in the East Bay Hills, such as degradation or habitat destruction. Finally, I asked students to rank the appropriateness of possible treatments, such as the use of herbicides, creating buffer zones and prescribed burning, as fire prevention measures in Strawberry Canyon.

Public Opinion and Perception of Strawberry Canyon

To analyze how student opinion on climate change influenced their perception of the Strawberry Canyon fire mitigation proposal, I asked students how important the issue of forest management in Strawberry Canyon was to them. I also asked students several questions in which they had to agree or disagree with statements concerning a range of topics, including the effectiveness of the fire mitigation proposal to efficiency of small-scale local policy at mitigating climate change. I used a combination of regression and chi-square analyses to determine any relationships between demographic variables and similarities between answers to different questions.

Attitudes and Knowledge of Climate Change

To determine how student attitudes and knowledge of climate change influenced their perception of Strawberry Canyon, I asked students what they thought was causing climate change. Students were also asked how worried they were about the risks associated with climate change, and how much they believed climate change would affect them personally. I used chi-square

analyses to identify if certain demographic variables were associated with specific attitudes or knowledge with climate change.

Public Opinion and Perception of Climate Change

To assess how student opinion on climate change influenced their perception of climate change and the Strawberry Canyon fire mitigation proposal, I asked students how important the issue of climate change was to students personally. To determine if there was a relationship between student perception of climate change and Strawberry Canyon, I used chi-squared analysis. To assess how certain demographics influenced student opinion and perception of strawberry canyon and climate change, I used chi-square analyses to identify if risks associated with climate change influenced student views on the proposed Strawberry Canyon fire mitigation project. Additionally, I used chi square assess the similarities between students' risk perception of the Strawberry Canyon fire mitigation proposal differ compared to their risk perception of climate change. These analyses revealed relationships between the public's opinions on Strawberry Canyon and climate change and helped me to assess how various demographics influenced certain responses to questions.

RESULTS

Data Collection

I received a total of 301 survey responses from students at University of California, Berkeley. A majority (58%) of respondents were Asian, and 34% identified themselves as white (Table 1). Approximately 50% of respondents were male and 50% were female and 75% were between the ages of 16 and 19. About 57% of students were also freshman and from the suburbs. 43% of students classified themselves as somewhat liberal when asked about their political identification, and the majority of students were from the College of Letters and Sciences with the most students being from Molecular and Cellular Biology or Integrative Biology.

Table 1. Survey Demographics

Background Variable	Sample Percentage	Background Variable	Sample Percentage
<i>Gender</i>		<i>Age</i>	
Male	49%	16-19	75%
Female	50%	20-22	21%
Other	0%	23-25	3%
		Over 25	1%
<i>Race</i>		<i>Grade Level</i>	
White	34%	Freshman	57%
Asian	58%	Sophomore	22%
Black or African American	1%	Junior	12%
Mixed	6%	Senior	6%
Native Hawaiian or Other Pacific Islander	1%	5th Year	2%
<i>Ethnicity</i>		<i>Hometown</i>	
No, Not of Hispanic Origins	91%	Urban	28%
Yes, Mexican American	6%	Suburban	67%
Other Hispanic	3%	Rural	5%
<i>Political Identification</i>		<i>Major</i>	
Independent	8%	College of Letters and Sciences	43%
Libertarian	6%	College of Natural Resources	21%
Somewhat Conservative	14%	College of Chemistry	3%
Somewhat Liberal	43%	Haas School of Business	13%
Very Conservative	4%	College of Environmental Design	1%
Very Liberal	16%	Other	5%
Other	12%	Undecided	14%

Data Analysis

Attitudes and Knowledge of Strawberry Canyon

I found that only 1% of students were very familiar with the Strawberry Canyon fire mitigation proposal and only 4% felt that forest management in Strawberry Canyon was an issue of “extreme” importance (Table 3). 80% of respondents thought that one of the impacts of the proposal in Strawberry Canyon would be lowering the amount of high severity fires in the area, whereas only 25% believed that it would mitigate environmental problems or the risks associated with climate change (Table 2). Approximately 72% of students believed that small-scale, local policy was an effective means of mitigating climate change. I found a strong association between respondents attitudes on the effectiveness of the proposed fire mitigation in Strawberry Canyon and their attitudes on small-scale local policy ($p=1.33E-11$).

Table 2. Survey Question on Attitudes and Knowledge of Strawberry Canyon

<i>Prior to reading this excerpt, how familiar were you with the proposed fire mitigation management plan for Strawberry Canyon?</i>	<i>Percentage</i>
Not at All Familiar	78%
Somewhat Familiar	14%
Familiar	6%
Very Familiar	2%
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<i>Please identify the impacts that you think the proposed fire mitigation plan in Strawberry Canyon may have on the environment in Strawberry Canyon? (Respondents marked all that applied)</i>	<i>Percentage</i>
Lower the likelihood of high severity fires and reduce the risk of harm to people or infrastructure	66%
Allow for native plants to recolonize	51%
Remove habitat suitable for wildlife	42%
Reduce watershed absorption capacity increase potential for flooding	43%
Eradicate invasive species	34%
Degrade the aesthetic and recreational quality of the area	38%

Increase temperature decrease humidity in the area					21%
Mitigate environmental problems risks associated with climate change					24%
<i>Please rank the following treatments in terms of appropriateness as fire prevention measures in Strawberry Canyon.</i>					
	<i>Not appropriate</i>	<i>Least appropriate</i>	<i>Somewhat appropriate</i>	<i>Appropriate</i>	<i>Most appropriate</i>
Removal of fire adapted non-native trees such as eucalyptus	18%	22%	24%	18%	19%
Use of herbicides to control understory plant growth	32%	39%	15%	10%	5%
Do not actively manage vegetation in Strawberry Canyon, just leave it as it is	28%	25%	28%	12%	8%
Conduct occasional low-intensity prescribed burns to reduce fuel loads in the understory	9%	8%	18%	32%	33%
Increase buffer zones or defensible spaces around infrastructure	13%	7%	17%	29%	36%

Public Opinion and Perception of Strawberry Canyon

One of the most important findings of this study was that 64% of students were uncertain as to whether the risks associated with Strawberry Canyon were related to climate change. The majority of students were concerned about the risk of wildfire locally in the East Bay Hills if no action were taken by the government, and 50% of participants were indifferent when asked if the Strawberry Canyon Proposal was the best way to prevent wildfire in that location. I found a strong association between respondents' opinions on the effectiveness of small-scale local policy and the effectiveness of the Strawberry Canyon Fire Mitigation Proposal as the best way to prevent wildfire ($p=1.373E-11$).

Table 3. Survey Questions on Public Opinion and Perception of Strawberry Canyon

<i>How important is the issue of forest management in Strawberry Canyon to you?</i>	<i>Percentage</i>
Not Important	6%
Not Too Important	27%
Somewhat Important	43%
Very Important	19%
Extremely Important	4%

<i>For each of the following, fill in the response that best represents your opinion.</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Indifferent</i>	<i>Agree</i>	<i>Strongly Agree</i>
The proposed fire mitigation in Strawberry Canyon is the best way to prevent wildfire in that location	3%	16%	50%	28%	2%
I am concerned about the risk of wildfire if no action is taken	4%	8%	37%	45%	7%
I see the proposed fire mitigation plan as a means of mitigating environmental problems and risks associated with climate change	1%	11%	41%	45%	3%
Small-scale local policy is an effective way of mitigating climate change	2%	8%	36%	44%	10%

<i>Please rank the risks associated with the predominance of non-native trees (particularly eucalyptus) in Strawberry Canyon in order of most serious to least serious.</i>	<i>Not serious</i>	<i>Least serious</i>	<i>Somewhat serious</i>	<i>Serious</i>	<i>Most serious</i>
Creates arid microclimates	18%	40%	22%	12%	9%
Aesthetically and recreationally pleasing	56%	20%	11%	9%	3%
Disrupts natural communities and ecological processes	5%	10%	24%	26%	35%
Fuel for fires	8%	13%	20%	29%	30%
Outcompete native plants	13%	16%	23%	24%	24%

Attitudes and Knowledge of Climate Change

I found that 50% of respondents believed climate change is caused mostly by human activities and 43% believed that climate change is caused by human activity and natural changes in the environment. 41% identified climate change as somewhat important compared to 1% who identified as climate change as an issue that is not at all important to them. I found that 53% of participants were somewhat worried about the “risks associated with climate change” and 36% believed climate change would affect them individually and frequently.

Table 4. Survey Questions on Attitudes and Knowledge of Climate Change

<i>Do you think that climate change is caused...</i>	<i>Percentage</i>
Mostly by human activities	50%
Mostly by natural changes in the environment	5%
Human activity and natural changes in the environment	43%
None of the above because climate change isn't happening	0%
Unknown reasons	2%

<i>Overall, how worried are you about risks associated with climate change?</i>	<i>Percentage</i>
Not at All Worried	4%
Not Very Worried	10%
Somewhat Worried	53%
Very Worried	34%

<i>How much do you think climate change will affect you personally?</i>	<i>Percentage</i>
Not at All	3%
Only a Little	17%
Occasionally	31%
Frequently	36%
Don't Know	13%

A majority of students identified “sea level rise” as one of most important and significant impacts of climate change, whereas a small minority of about 3% of students identified an increase in urban wildfires as an impact of climate change that was most important to those individuals. The majority of participants were most worried about the increase of deaths, illnesses and injuries from extreme weather events associated with climate change. 64% of participants were unsure as to whether the current risk of fire in Strawberry Canyon was directly related to climate change. Participants that were natural sciences majors were more likely to believe that the current risk of fire in Strawberry Canyon was directly related to climate change.

Table 5. Survey Questions on Public Opinion and Perception of Climate Change

<i>Please rank the following risks associated with climate change in order of most concern to you. (1=most concern and 8=least concern)</i>	1	2	3	4	5	6	7	8
An increase in the transmission and incidences of infectious diseases	17%	23%	13%	14%	9%	10%	9%	1%
Increase in the number of deaths, illness and injury from floods, storms, wildfires and other extreme weather events	28%	20%	20%	12%	10%	6%	4%	1%
Unsafe drinking water	18%	16%	22%	17%	22%	6%	6%	4%
Impaired nutrition, health, and survival due to reduced crop, livestock and fisheries yields	8%	14%	13%	23%	20%	13%	5%	1%
Increase in poverty due to the loss of livelihoods and displacement	7%	6%	10%	11%	8%	24%	13%	9%
Reduced global and local biodiversity	15%	8%	6%	5%	8%	18%	14%	26%
Loss of life and property associated with increased incidence of wildfire	2%	5%	0%	6%	12%	11%	33%	29%
Increased susceptibility to adverse health effects such as respiratory infections, post-traumatic stress disorder and heat stroke	5%	7%	10%	13%	11%	10%	15%	28%

Please rank the possible impacts of climate change in order of importance to you. (1=most important and 8=least important)

	1	2	3	4	5	6	7	8
Sea level rise	28%	15%	18%	13%	9%	9%	4%	4%
Changes in weather patterns	13%	24%	17%	14%	13%	8%	8%	3%
Increased frequency and intensity of extreme weather events	19%	17%	24%	14%	14%	6%	4%	2%
Human migration	6%	6%	7%	13%	14%	17%	18%	19%
Habitat loss	10%	17%	11%	13%	18%	17%	11%	3%
Increased risk of urban wildfire	3%	4%	4%	10%	9%	17%	22%	31%
Agricultural land change	5%	4%	4%	10%	9%	17%	22%	31%
Species loss	16%	11%	11%	13%	11%	8%	12%	19%

How important is the issue of climate change to you?

Percentage

Not Important	8%
Not Too Important	10%
Somewhat Important	39%
Very Important	30%
Extremely Important	14%

In your opinion, is the current risk of fire in Strawberry Canyon directly related to climate change?

Percentage

Yes	14%
I Am Not Sure	64%
No	11%
I Don't Know	11%

DISCUSSION

Although most students had well-developed risk perception of both the impacts of the Strawberry Canyon fire mitigation proposal and of climate change, most students demonstrated uncertainty when asked if the risks associated with the Strawberry Canyon fire mitigation proposal

were directly related to climate change. The majority of students were not at all familiar with the Strawberry Canyon mitigation proposal, but were still able to successfully identify the potential impacts that non-native trees may have on the surrounding communities. Despite the fact that most students were aware and concerned about the impacts of climate change, there are still many common misconceptions associated with climate change. Many of these misconceptions stem from various forms of escapism, the tendency to seek distraction and relief from unpleasant realities, in which respondents distance themselves from the issue (Hirschman 1983). These findings suggest that students have the necessary knowledge but still fail to recognize the link between climate change as a global phenomenon and the local impacts it may have on our local communities.

Attitudes and Knowledge of Strawberry Canyon

Most students were not familiar with the proposed Strawberry Canyon fire mitigation proposal for several possible reasons. One of the most important factors being that this issue became popular and publicized more during the months of May 2013 through July of 2013, when many students were absent from campus. In addition, the majority of the survey respondents were freshmen, meaning that most of the survey population may not have been as familiar with local issues around campus compared to students who have been at UC Berkeley for a longer period of time. Despite these factors, students were still able to successfully identify several of the impacts that invasive species may have on Strawberry Canyon that have been frequently voiced by many residents and public officials. This implies that without any previous knowledge of the proposal and based on the information provided to them, students were able to formulate their own risk perceptions and make sound judgments on assessing the potential risks or impacts that non-native species may have in the surrounding area. Therefore, an individual's knowledge, experiences and attitudes help to guide the public successfully identify societal risks such as the local forest management in Strawberry Canyon. This in return allows for the necessary adoption of climate policies to be implemented in order to mitigate risks from global climate change.

Public Opinion and Perception of Strawberry Canyon

Although students saw the issue of forest management in Strawberry Canyon as a somewhat important issue, most students did not see the proposed fire mitigation in Strawberry Canyon as the best way to prevent wildfire in that location. This disconnection between perceptions of the forest management proposal and the problem it aims to mitigate could be for a variety of reasons. One possible explanation emerges from differences in the development of an individual's risk perception and their societal risk perception (Leiserowitz 2006). Students might personally perceive non-native trees as a major threat personally, but not on a larger scale like the local community. Social and cultural values, worldview and personal experiences play a critical role in the development and risk perception and behavior (Leiserowitz 2006). Therefore, residents who experienced the devastation of the 1991 Oakland-Berkeley Fire may be more concerned about wildfire in the East Bay and more likely to see the Strawberry Canyon fire mitigation proposal as the best way to prevent fire.

Another explanation stems from the fact that forest terminology may have been unfamiliar to many respondents, making it difficult for some individuals to understand the true nature of the forest management proposal (Tahvanainen 2001). In addition, students might not see the Strawberry Canyon proposal as an important issue because forests have different values to different populations, meaning that certain populations may be opposed to the forest management project due to aesthetic and recreational values (Tahvanainen 2001). Finally, studies have shown that audible and verbal information effects people's preference for various forest management practices in relation to the forest environment (Tahvanainen 2001). Therefore, the type of textual information given to participants at the beginning of the survey could have misguided students' responses.

Attitudes and Knowledge of Climate Change

Most students demonstrated a high awareness of climate change, a strong belief that it is caused by mostly human activities and significant concern about the issue, which is similar to the findings of other studies (Lieserowitz 2005). Although students stated what they thought about climate change frequently, they were only somewhat concerned about the risks associated with climate change. Climate change remains an issue that the public does not consider a priority

relative to other societal issues such as the economy, healthcare or national security (Lieserowitz 2010). Intriguingly, as one of the most publicized consequences of climate change by the media, many students identified sea level rise as one of the most concerning impacts that will result from climate change. Another interesting finding was that students identified an increase in rates of death, illness and injury from extreme weather events due to climate change. One of the issues affecting the public's concern for climate change has been a lack of development of societal and personal risk perception towards the threats that climate change poses (Lieserowitz 2008). But recently, events such as Hurricane Sandy and Hurricane Katrina have allowed the public to witness how climate change might impact people's everyday lives. Most students currently believe that climate change is caused by human activity or a combination of human activity and natural changes in the environment. This suggests that students are knowledgeable of climate change, but are unable to identify the local risks associated with climate change such as the Strawberry Canyon fire mitigation proposal.

Public Opinion and Perception of Climate Change

One of the most important findings of this study was that 64% of students were uncertain as to whether the risks associated with Strawberry Canyon were related to climate change. There could have been a variety of reason as to why a majority of students found it difficult to make this link. One of the main factors that could have contributed to student uncertainty is a lack of knowledge of how climate change impacts local communities (Lieserowitz 2008). Climate change is often framed as a global issue rather than as an issue that is primarily on the national or local level, making it difficult for the public to identify the impacts of climate change relative to where one may live (Betsill 2001). This is evident in students, indifference concerning whether the Strawberry Canyon fire mitigation proposal was the best way to prevent fire in that area, yet a large majority of students agreed that local policy was an effective way of mitigating climate change. The disconnection between risk perception about the general effectiveness of small scale local policy and its effectiveness in mitigating impacts due to climate change may also be due respondents' mutual distancing, a form of escapism, from climate change in which individuals essentially forget or separate themselves from the reality of a problem (Rosentrater 2013). Similarly, when students were asked to rank the risks and impacts associated with climate change,

a substantial portion of students were “least” concerned about loss of life and property due to increased incidences of fire and were “least” concerned with the increased risk of urban wildfire. This could also be due to the lack of framing by local officials of the Strawberry Canyon fire mitigation proposal as a climate change issue (Betsil 2001). These findings suggest that students are still unsure as to whether climate change will have a direct or indirect effect on Strawberry Canyon. Although students seemed to understand the risks of non-native species in Strawberry Canyon and the risks of climate change, they were still not able to determine if a relationship existed between these two variables.

Limitations and Future Directions

Time constraints, limited access to specific populations and sample method limited my study. Students were incentivized to take the survey for extra credit making more students likely to take the survey than others. This also led to a somewhat diversified population, however because my study population was UC Berkeley students, my conclusions may not be representative of East Bay residents’ demographic make up as well as perceptions therefore limiting the inferences of my study. One of the most significant limitations of my study was that due to time constraints and in order to use a more efficient means of sampling residents’ opinions on climate change and on the Strawberry Canyon fire mitigation proposal, UC Berkeley students were surveyed for convenience. Although this sampling approach was efficient for developing a large enough sample size to conduct statistical analyses and draw conclusions from my data, there was a sampling bias due to convenience sampling methods. Other factors that limited my study was that because I had limited access to residents in the East Bay community due transportation, time and money, I was not able to directly survey community members on the strawberry canyon fire mitigation proposal. Due to time constraints, I was not able to interview as many community members, students and professors necessary. Despite the limitations to the inferences of my study, there are still many important findings such as the disconnection between climate change and public perception that will require further exploration of the factors that influence these variables through surveying public perception on local management issues that are related to climate change.

Broader Implications

Public perception of the Strawberry Canyon fire mitigation proposal demonstrates how uncertainty and escapism play roles in the development of an individual's societal risk perception concerning the local impacts of climate change. Public risk perception has the ability to compel or constrain political, economic and social action to address climate change in which public support or opposition to climate policies will be greatly influenced by public perceptions of the risks and dangers of global climate change. While the public has increasingly come to accept that climate change is occurring, uncertainty remains about the nature of specific and often unpredictable impacts of climate change especially in our local communities. As local governments develop more innovative policies and programs to address climate change, the importance of understanding how the public perceives risks associated with the impacts of climate change and its effects on our environment are critical to effective policy making. The dynamic and complex nature of climate change science and the complexity of causes, processes and outcomes associated with climate change globally and locally underpin misconceptions about the risks, impacts and threats that climate change poses to the public. Comprehending how the public influences and perceives small-scale localized climate change policy, management, and mitigation could help inform the development of a much-needed national or international climate change framework necessary to address the unavoidable impacts climate change poses in this anthropogenic era. As the effects of global climate change are manifested and made apparent, not just globally but in local communities, addressing the knowledge gap of the public is critical in adapting to and mitigating the impacts of climate change.

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REFERENCES

- Adger, W. N., S. Dessai, M. Goulden, M. Hulme, I. Lorenzoni, D. R. Nelson, and A. Wreford. 2009. Are there social limits to adaptation to climate change? *Climatic Change* 93:335-354.
- Christianson, G. E. 1999. *Greenhouse; The 200-Year Story Of Global Warming*. Walker and Company, New York, New York, United States.
- Erikson, R. S., M. B. MacKuen, and J. A. Stimson, 2002. *The macro polity*. Cambridge University Press, Cambridge, United Kingdom.
- Fried, J. S., M. S. Torn, and E. Mills. 2004. The impact of climate change on wildfire severity: a regional forecast for northern California. *Climatic Change* 64:169-191.
- Hirschman, E. C. 1983. Predictors of self-projection, fantasy fulfillment, and escapism. *The Journal of social psychology* 120:63-76.
- Leiserowitz, A. 2008. Public perception, opinion and understanding of climate change – current patterns, trends and limitations. United Nations Development Program (UNDP), New York, New York, USA. 2008/papers/leiserowitz_anthony.pdf
- Leiserowitz, A., E. Maibach, and C. Roser-Renouf. 2010. Climate change in the American Mind: Americans' global warming beliefs and attitudes in January 2010. Yale Project on Climate Change. Yale University and George Mason University. New Haven, CT.
- Lorenzoni, I. and N. F. Pidgeon, 2006. Public views on climate change: European and USA perspectives. *Climatic Change* 77: 73-95.
- McKenzie, D., Z. Gedalof, D. L. Peterson, and P. Mote. 2004. Climatic Change, Wildfire, and Conservation; Cambio Climático, Incendios y Conservación. *Conservation Biology* 18:890-902.
- Monroe, A. D. (1998). Public opinion and public policy, 1980-1993. *Public Opinion Quarterly* 62: 6-28.
- Page, B. I., and R. Y. Shapiro, 1983. Effects of public opinion on policy. *The American Political Science Review* 77:175-190.
- Poortinga, W., A. Spence, L. Whitmarsh, S. Capstick, and N. F. Pidgeon, 2011. Uncertain climate: An investigation into public skepticism about anthropogenic climate change. *Global Environmental Change* 21:1015-1024.

- Rosenzweig, C., W. Solecki, S. A. Hammer, and S. Mehrotra. 2010. Cities lead the way in climate-change action. *Nature* 467:909-911.
- Shapiro, R. Y., and L. R. Jacobs. 2000. Who Leads and Who Follows? U.S. Presidents, Public Opinion, and Foreign Policy. Pages 223-245. *Who Leads and Who Follows? Decisionmaking in a glass house: Mass media, public opinion, and American and European foreign policy in the 21st century.* Rowman and Littlefield Publishers Inc., Lanham, Maryland, USA.
- Scholze, M., W. Knorr, N. W. Arnell, and I. C. Prentice. 2006. A climate-change risk analysis for world ecosystems. *Proceedings of the National Academy of Sciences* 103:13116-13120.
- Schreurs, M. A. 2008. From the bottom up local and subnational climate change politics. *The Journal of Environment & Development* 17:343-355.
- Taylor, Tracey. "UC Berkeley expert talks about hillside tree removal plan." *Berkeleyside* [Berkeley, Ca,] 11 Jun. 2013:All.Print.
- Tompkins, E. L., W. Adger. 2004. Does adaptive management of natural resources enhance resilience to climate change? *Ecology and society* 9:10.
- Upham, P., L. Whitmarsh, W. Poortinga, K. Purdam, A. Darnton, C. McLachlan, and P. Devine-Wright. 2009. *Public Attitudes to Environmental Change: a selective review of theory and practice. A research synthesis for the Living With Environmental Change Program.* Research Councils, London, UK.
- U.S. Department of Homeland Security Federal Emergency Management Agency [USDHS]. 2013. East Bay Hills Hazardous Fire Risk Reduction Environmental Impact Assessment. Federal Emergency Management Agency [FEMA]. USDHS, Washington, D.C., U.S.A. http://ebheis.cdmims.com/Files/D_Fact%20Sheet%201_04-03-13_508.pdf
- Wilbanks, T. J., and R. W. Kates. 1999. Global change in local places: how scale matters. *Climatic Change* 43:601-628.

APPENDIX A: Survey Questions

- 1.) What is your gender?

- Male
- Female
- Other

2.) Are you a person of Hispanic, Latino or Spanish origin?

- No, not of Hispanic, Latino or Spanish origin
- Yes, Mexican, Mexican American, Chicano
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic, Latino or Spanish origin

3.) Please specify your race.

Mark all that apply.

- Asian
- American Indian or Alaska Native
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White

4.) Which of the following best describes where you grew up?

- Urban
- Suburban
- Rural

5.) What is your age?

- 16-19
- 20-22
- 23-25
- Over 25

6.) What is your current year/grade in college?

- 1st/Freshman
- 2nd/Sophomore
- 3rd/Junior
- 4th/Senior
- 5th/Senior

7.) What is your political identification?

- Independent
- Very Conservative
- Somewhat Conservative
- Very Liberal
- Somewhat Liberal
- Libertarian
- None of the above

8.) What is your political identification?

- Very Frequent
- Somewhat Frequent

- Infrequent
- Never

9.) What is your declared/intended major?

Strawberry Canyon Fire Mitigation Management Plan

To implement “hazardous risk reduction” projects in the East Bay hills and elsewhere, the University of California, Berkeley, the City of Oakland, and the East Bay Regional Park District have applied to FEMA, through the California Emergency Management Agency, for financial assistance under FEMA’s Pre-Disaster Mitigation Program and the Hazard Mitigation Grant Program.

A project being implemented locally in Strawberry Canyon, on University of California property, is designed to reduce wildfire hazard and risk by removing thousands of non-native trees (primarily eucalyptus, Monterey pine, and acacia). This will include chipping cut trees, and leaving many of the chips in place for sediment and invasive weed control. The agencies will then apply herbicides to the cut stumps to prevent resprouting. Additionally, they may reuse large logs to control erosion on slopes and, in some areas, might thin or remove native vegetation such as coyote brush. The agencies also may burn cut brush and branches in piles and use further control measures such as grazing or herbicide spraying on foliage.

10.) Prior to reading this excerpt, how familiar were you with the proposed fire mitigation management plan for Strawberry Canyon?

- Very familiar
- Familiar
- Somewhat familiar
- Not at all familiar

11.) How important is the issue of forest management in Strawberry Canyon to you?

- Extremely important
- Very important
- Somewhat important
- Not too important
- Not at all important

12.) Please identify the possible impacts that the proposed fire mitigation plan in Strawberry Canyon may have on the environment in Strawberry Canyon? Mark all that apply.

- Lower the number of high severity fires
- Allow for native plants to recolonize
- Reduce or eliminate harm to people and damage to structures
- Remove habitat suitable for wildlife

- Reduce watershed absorption capacity
- Eradicate invasive species
- Increase temperature / decrease humidity in the area
- Mitigate environmental problems / risks associated with climate change

13.) For each of the following, fill in the response that best represents your opinion.

	Disagree	Somewhat disagree	Indifferent	Somewhat agree	Strongly agree
The proposed fire mitigation in Strawberry Canyon is the best way to prevent wildfire in that location.					
I am concerned about the risk of wildfire if no action is taken.					
I see the proposed fire mitigation plan as a means of mitigating environmental problems and risks associated with climate change.					
Small-scale local policy is an effective way of mitigating climate change.					

14.) Please rank the following treatments in terms of effectiveness as fire prevention measures in Strawberry Canyon.

	Not effective	Least effective	Somewhat effective	Effective

Removal of non-native trees				
Use of herbicides				
Leave Strawberry Canyon as it is				
Prescribed burning				

15.) Please rank the risks associated with non-native trees in Strawberry Canyon.

	Least serious	Somewhat serious	Serious	Most serious
Creates arid microclimates				
Outcompete native plants				
Disrupt natural communities and ecological processes				
Fuel for fires				

16.) Assuming climate change is happening, do you think it is...

- Caused mostly by human activities
- Caused mostly by natural changes in the environment
- None of the above because climate change isn't happening
- Unknown reasons

17.) Please rank the following risks associated with climate change in order of most concern to least concern to you.

- An increase in the transmission and incidences of infectious diseases
- Drowning
- Increased susceptibility to respiratory infections and other adverse health effects
- An increase in the amount of thermal stress that occurs within the body

- Deaths, illness and injury from floods, storms, cyclones and wildfires
- Unsafe drinking water
- Impaired nutrition, health, and survival due to impaired crop, livestock and fisheries yields
- Increase in poverty due to the loss of livelihoods and displacement, leading to poverty
- Increase in heat stroke and dehydration
- Increase in daily deaths and disease events
- Increase in mental health impacts such as depression and post-traumatic stress disorder

18.) Overall, how worried are you about risks associated with climate change?

- Very worried
- Somewhat worried
- Not very worried
- Not at all worried

19.) Please explain your primary concern about climate change in three sentences or less.

20.) How much do you think climate change will harm you personally?

- Not at all
- Only a little
- A moderate amount
- A great deal
- Don't know

21.) How important is the issue of climate change to you personally?

- Not at all important
- Not too important
- Somewhat important
- Very important
- Extremely important

22.) Please rank the possible impacts of climate change in order of importance to you.

- Sea level rise
- Changes in weather patterns
- Increased frequency and intensity of extreme weather events
- Human migration
- Habitat loss
- Increased risk of urban wildfire
- Agricultural land change
- Species loss

23.) In your opinion, are the risks associated with Strawberry Canyon directly related to climate change?

- Yes
- No
- I am not sure
- I don't know

24.) If so, why?