DISPLACED AND BURNT-OUT: A LOOK AT RECREATION EXPERIENCES IN SOUTHERN CALIFORNIA NATIONAL FORESTS

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ABSTRACT

When deciding to engage in an outdoor activity, recreationists often have a specific activity and setting in mind that they would like to participate in, like hiking or boating on a favorite trail or lake, respectively. When they set out for this experience but are unable to recreate in their desired way, they may leave feeling disappointed by the lack of engagement and misalignment between their experience and desired outcomes. To guide visitors to suitable alternative recreation experiences due to events such as extreme heat, wildfires, etc., a better understanding of displacement, information sources, perceived fire risk, and fire-related message fatigue is needed. The Los Padres, San Bernardino, Cleveland, and Angeles forests are four urban-proximate national forests in southern California. These forests are utilized by approximately 26 million people, to meet the local peoples' recreation needs.

This thesis builds from a multi-part project and is organized into four distinct chapters. My findings draw attention to the main drivers and types of displacement experienced by recreationists, the sources used by recreationists to find out forest related information, and the role of message fatigue regarding wildfire risk perception. By using quantitative methods, I aim to address four research questions: (1) What form(s) of displacement, if any, have users experienced, and with that, what are the main drivers and types? (2) How do these drivers and types of displacement vary by (a) multigenerational households and (b) motivations (Cultural Ecosystem Services) (3) How much, if at all, are southern California residents who recreate locally in national forests experiencing message fatigue regarding wildfire and wildfire risk events? and (4) Do levels of message fatigue relate to their decision-making processes and perceptions of risk? Chapter 1 provides a comprehensive literature review of this thesis and these questions. Chapter 2 addresses questions 1 and 2, while chapter 3 addresses questions 3 and 4. Chapter 4 summarizes contributions across the two main research questions and chapters.

To the numerous mentors I've had on this journey, thank you.

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LIST OF ABBREVIATIONS

CES Cultural Ecosystem Services

Chapter 1: Literature Review.

SOUTHERN CALIFORNIA NATIONAL FORESTS

Areas of forests used by recreationists can sometimes see impacts caused or exasperated by their recreation activities. Sites with more visitation may be more impacted by higher user traffic, while sites and features that receive less visitation, and fewer concentrated types of visitations, may potentially have higher quality resources and experiential conditions. However, the dynamic intersection of recreation use and types, managerial approaches, and natural and cultural resources create site-specific impacts. High-use sites and features, and the spatial disparity of use across nearby sites and features, has led to challenges related to the social, managerial, and environmental aspects of forests and their sites. Crowding, unsafe vehicle parking from overflowing/informal parking lots, managerial strain on staff-time at these highly visited locations (Thomas & Reed, 2019; Hannon, 2021), and damage to fragile habitats/species have occurred in forests nationwide, including those in southern California.

California is a naturally fire prone state, but recently fires have further increased in duration and intensity in part due to climate change and in part due to human activity. Between 1992 and 2020, 12% of fires in Washington, Oregon, and California were due to recreation activities with 50% of these fires taking place on US Forest Service land (Jenkins et al., 2023). Overall, 89% of wildfires are human caused (Congressional Research Service, 2023). In southern California, national forests are urban-proximate recreation areas: outdoor leisure spaces near cities or towns. These urban-proximate national forests are of interest because they hold great opportunity for outdoor recreation in highly populated areas. With these forests being near cities and towns, they often serve diverse user groups. As more than 80% of Americans and the majority of the world's population lives in urban areas (Ritchie & Roser, 2018), urban-proximate forests will only increase in importance for recreation, rejuvenation, and respite. In southern California, the Los Padres, Angeles, San Bernardino, and Cleveland National Forests are four

such urban-proximate forests. These four are used by two-thirds of California's population, approximately 26 million people, to meet the local peoples' recreation needs. Unfortunately though, with these forests being used by large numbers of visitors each year comes the potential also for large amounts of recreation displacement, a behavioral response to one or many undesirable conditions or conflict (Fefer et al., 2021; Johnson & Dawson, 2004; Manning & Valliere, 2001).

DISPLACEMENT

Displacement can take place at the spatial level, temporal level, by activity substitution, or with total displacement (Needham & Vaske, 2013). Certain recreation groups such as first-time users, those who are less invested in or attached to the experience, and individuals with less knowledge about recreation are more prone to total displacement (Needham & Vaske, 2013; Perry et al., 2021). Displacement is usually experienced by those who are more sensitive to factors like conflict, crowding, facility problems, environmental impacts, management conditions, and climate change effects (Hall & Shelby, 2000; Needham & Vaske, 2013; Perry et al., 2018a). While there has been substantial research on spatial, temporal, and activity displacement, total displacement has not been as well studied and typically noted as being possible in articles looking at other forms of displacement (e.g., Johnson & Dawson, 2004; Perry et al., 2018a). This is typically because studies focus on on-site recreationists who have previously been displaced or have considered displacement but have mitigated that to still recreate on-site during a study period, or visitors presented with scenarios asking about displacement reactions (e.g., increasing climate change effects, Perry et al., 2021). There is also a lack of information on the role that companions may play in displacement. With recreation activities being highly social interactions, the lack of a companion or concerns for a companion's

safety may affect displacement behaviors. This has the potential to contribute to recreation participation disparities seen in recreation across populations and disproportionally affect those who have historically been marginalized or excluded from such experiences (e.g., those who have lower socioeconomic status, racial and ethnic minorities, women, LGBTQIA, non-binary individuals).

Most research is concerned with the increase in use levels and work under the assumption that recreationists are goal-oriented, have a motive for pursuing a certain activity at a certain place and time, and have a conscious evaluation of an experience to meet their goals (Hall & Shelby, 2000). This research can be expanded to look at factors other than increased use levels, such as cultural ecosystem services (the non-material benefits we derive from nature; Chan et al., 2001; Coleman et al., 2020; Romanazzi et al., 2023). Cultural services such as ethical values, inspiration, and connection to place, can be benefits sought, or motivators, for visitation to national forests. It is expected that individuals will experience these cultural benefits differently based on their own personal life experiences and the level of place attachment they have to a specific location. While ecosystem services have been studied, this has typically neither been in the realm of recreation nor specifically for cultural ecosystem services and the motivation these services might produce. Cultural ecosystem services have yet to be linked to displacement as well.

One option forest managers can try to reduce displacement seen in southern California forests is to create messages that give recreationists opportunities for a quality experience. Managers need to be cognizant of the needs of different users or user groups when creating messaging (e.g., signage, handouts), because repeat messaging can result in message fatigue. For example, this area of California is highly vulnerable to drought and tree mortality due to bark

beetle infestations, increasing the risk of fire and forest closures. This combination increases the amount of fire messaging to which California residents are exposed, potentially changing how recreationists internalize messages created to avoid displacement.

MESSAGE FATIGUE

In national forests, the safety of visitors is of paramount importance to managers and their primary source of safety information is the use of signs (Saunders et al., 2019). There are other ways to promote the safety of visitors, such as fencing and barriers. However, the most preferred way is through persuasive communication that influences their behaviors (Saunders et al., 2019), as more permanent features can disrupt the visitor experience (Marion & Reid, 2007). Message fatigue adds to the difficulty of keeping visitors safe through different messaging formats, where individuals become burnt out from receiving or interacting with messages on a topic resulting in behavioral changes that reduce uptake of information (Mackie 2014; Reynolds-Tylus et al., 2021; So et al., 2017). This poses a challenge to the US Forest Service in southern California during times of risk events, such as wildfires. Visitors experiencing message fatigue could change the level of risk they find acceptable without realizing it while they are out enjoying a day in the forest. This change in risk perception has the potential to put these visitors at an increased risk of finding themselves in dangerous situations that could have been avoided if message fatigue was better understood and managed regarding wildfires or wildfire risk.

RESEARCH INQUIRY

This thesis is couched within a larger and more expansive program of research, Recreation Displacement: SoCal National Forests, but Chapters 2 and 3 provide more focused insight contributory to this broader project. In these distinct Chapters, I employ a suite of quantitative methods to address four research questions.

1. What form(s) of displacement, if any, have users experienced?
    a. What drivers are forcing displacement (e.g., extreme heat, fire risk)?
    b. What type(s) of displacement are being utilized (spatial, temporal, activity, total, or companion)?
2. How do these drivers and types of displacement vary by:
    a. Those living in multigenerational households?
    b. By the motivations (cultural ecosystem services as proxies) of the recreationist?
3. How much, if at all, are southern California residents who recreate locally in national forests experiencing message fatigue regarding wildfire and wildfire risk events?
4. How do levels of message fatigue relate to their decision-making processes and perceptions of risk?

Chapter 2 address questions 1 and 2 via quantitative analysis concerning the types of displacement (spatial, temporal, activity substitution, total, and companion) being used by respondents and how these change based on the household respondents live in and the cultural ecosystem services they are seeking when recreating. The populations examined were decided upon by the research team at Michigan State University in conjunction with our partners at the US Forest Service and Kansas State University. Chapter 2 provides an overview of the types of displacement being used and discusses lessons learned from this inquiry and missing pieces raised for consideration.

Chapter 3 addresses questions 3 and 4 via quantitative analysis concerning message fatigue being experienced by recreationists and how this fatigue influences their risk perception regarding fires, using scaled questions similar to Ferrer et al. (2016). Our study involved creating fatigue clusters and an in-depth analysis on how those clusters relate to risk perception. Chapter

3 provides an overview of the different information sources used by recreationists, levels of fatigue found, changes in risk perception, lessons learned from this inquiry, and missing pieces raised for consideration.

Chapter 4 briefly ties together key themes from the differentiated investigations defining Chapters 2 and 3. In this final Chapter of the thesis, I examine what the findings and implications from the two focused studies mean for managers of the four national forests. This Chapter includes revisiting the research questions listed above and the knowledge I contribute to these, theoretical implications, and the larger recreation discussion overall.

This thesis ultimately explores the relationships between messaging, displacement, and message fatigue in four national forests of southern California. As these forests play an important role in filling a need for outdoor recreation, it is necessary to understand how recreationists are interacting with messages created by the US Forest Service. The findings throughout this thesis support the need to focus on creating better, targeted messages to reduce displacement and increase risk awareness in recreationists. Though the primary audience of this work is academics and US Forest Service managers and scientists, I expect that the approaches and themes described have relevance for everyone associated with recreation and risk communication.

Chapter 2: Play and peril: Displacement drivers and types across multigenerational households and recreation motivations.

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ABSTRACT

Many southern California residents use urban-proximate forests (forests near cities or towns) to meet their recreation needs, but with climate change, displacement is of concern due to the potential of national forest degraded conditions and/or closures. Displacement could result in recreationists completely forgoing the forests for other forms of leisure activities and may be influenced by such factors as motivations for visiting (cultural ecosystem services), and whether recreationists live in a multigenerational household (implying their closest recreation companions may be of differing ages). Offering visitors information on different locations, times, and activities could keep recreationists returning to national forests during their leisure time. To guide would-be visitors to suitable alternative recreation experiences when they are unable to recreate as they want due to undesirable conditions (e.g., crowding, poor conditions), a better understanding of how recreationists are experiencing and reacting to displacement is needed. Based on a 2023 survey of southern California residents who recently visited at least one of the four forests in the study area (Los Padres, San Bernardino, Cleveland, and Angeles National Forests) (n=3,585), we found that road closures and extreme heat are two large drivers of displacement affecting recreationists. Those living in multigenerational households are significantly more affected by spatial, temporal, activity, companion, and total displacement, and those with more encompassing cultural ecosystem service motivations are less likely to cancel all plans compared to those with narrower set of such motivations. This suggests that different groups are feeling displacement differently and the US Forest Service will need to consider that when creating recreation opportunities for high-quality experiences of displaced recreators.

Keywords: Recreation, southern California, Displacement, Multigenerational, Cultural Ecosystem Services

1. INTRODUCTION

Recreation areas serve as places for bonding with the natural environment, among other benefits. But, if improperly managed, these areas can become degraded with time (White et al., 2008). With recreation at national forests increasing steadily, rapidly, and unevenly across sites (USDA Forest Service 2021), some recreational trails, waterbodies, campgrounds, and other attractions receive higher levels of use than others. National forests and grasslands saw 25 million more visitors in 2020 than in 2019 and wilderness areas saw an increase of 25% more visitors over this timespan (Avitt, 2021). Left unchecked, or inappropriately managed, high use areas can result in the degradation of resources and conditions. To combat this, one difficult strategy managers have is the creation of messages that disperse visitors to avoid increased, concentrated degradation while still offering experiences comparable to what visitors expect. These messages could cause displacement if not correctly created.

Updated displacement data are a critical first step for managers in creating messages to reduce displacement seen at national forests. Too much displacement coping can be stressful to individuals (Manning & Valliere, 2001), resulting in the opposite experience than intended at these locations. Motivations for recreation potentially play into whether displacement occurs. Cultural ecosystem services are the non-material benefits humans derive from nature (e.g., inspiration to create art, health benefits, conservation value) (Gould & Lincoln, 2017). Increasingly, studies show ecosystem services in general, and cultural ecosystem services in particular, as good for our physical and mental health (Remme et al., 2021). Therefore, understanding cultural ecosystem services' role in recreationists' motivations and displacements can help managers target displacement messages based on motivating factors. Furthermore, understanding types and rates of displacement based on whether a recreationist lives in a

multigenerational household and thus may turn to a multi-age group as their closest recreation companions, can add needed demographic information for managers to further refine these messages.

2. LITERATURE REVIEW

Over 80% of Americans and 50% of the world's population lives in urban areas (Ritchie & Roser, 2018), suggesting that urban-proximate forests will only increase in importance for recreation, rejuvenation, and respite. In southern California, urban-proximate national forests are of interest because they provide a great opportunity for outdoor recreation in highly populated areas with diverse user groups Specifically, the Los Padres, Angeles, San Bernardino, and Cleveland National Forests are four such urban-proximate forests. These are utilized by two-thirds of California's population, approximately 26 million people, to meet the local recreation needs. Managers need to be cognizant of the needs of different users or user groups within this local populations when creating messaging (e.g., signage, handouts) to avoid displacement and/or suggest viable alternative recreation if displacement occurs.

High use areas utilized by recreationists can sometimes see impacts caused or exasperated by recreation activities. Sites with more visitation may be more impacted by this higher user traffic while sites and features that receive less visitation, and less concentrated types of visitations, potentially result in higher quality resources and experiential conditions. However, the dynamic intersection of recreation use and types, managerial approaches, and natural and cultural resources create site-specific impacts. The high-use sites and features, and spatial disparities of use across nearby sites and features, has led to challenges related to the social, managerial, and environmental aspects of the recreation site. This is the longstanding three-fold framework (Manning et al., 2022), which has recently been extended to a more spatially,

temporally, and topically comprehensive Integrated Recreation Amenities Framework (Perry et al., 2020). All these aspects are important to consider in displacement. Crowding, unsafe vehicle parking from overflowing/informal parking lots, managerial strain on staff-time at these highly visited locations (Thomas & Reed, 2019; Hannon, 2021), and damage to fragile habitats/species have occurred in forests nationwide, including those in southern California. The COVID-19 pandemic encouraged people to spend their leisure time outdoors and amplified these impacts, as more people explore their national forests (Ferguson et al., 2022; Shartaj et al., 2022). With an increase in participation in nature-based activities (Thomas & Reed, 2019), these negative experiences and/or degraded resource conditions at sites could lead to the displacement of recreationists in national forests.

Expectancy theory suggests that we engage in recreation activities in particular locations to realize beneficial outcomes that are known, desired, and valued (Manning et al., 2022). When people encounter barriers to this engagement, they will often adjust to still reach their desired outcome. Displacement is one such adjustment, or coping mechanism, that results when a recreationist encounters undesirable conditions – those that prevent or do not meet the recreationist's standards of a quality experience – that include the chosen spot being unavailable or not suitable for their chosen activity or there is some type of conflict (Johnson & Dawson, 2004; Manning & Valliere, 2001). Displacement can be used as a coping mechanism to maintain the quality experience desired by the recreationist (Fefer et al., 2021; Johnson & Dawson, 2004; Manning & Valliere, 2001) and as an indicator of the quality of the experience (Fefer et al., 2021). Coping, according to Sutherland (1996), is "any behavior, whether deliberate or not, that reduces stress and enables a person to deal with a situation without excessive stress." Displacement has been recognized as a recreation coping mechanism for at least 50 years

(Manning & Valliere, 2001), when Clark et al. (1971) characterized it as “invasion and succession”, with his example being campers who seek solitude and connection to nature move out as areas become crowded or developed and less nature focused campers move in. More recently, a major factor influencing displacement is climate change. The effects of climate change (e.g., wildfire, drought, invasive species, flooding) are forcing recreational displacement due to park and protected area closures (Monz et al., 2021), and are expected to increase in the future and propel further displacements (Perry et al., 2021).

2.1 Displacement

Displacement can occur at the spatial level (different location), at the temporal level (different time), by activity substitution, or with total displacement (Needham & Vaske, 2013). While there has been a lot of research done on three of the four forms of displacement, total displacement is not as well studied and typically only noted as being possible in articles looking at the other forms of displacement (e.g., Johnson & Dawson, 2004; Perry et al., 2018a). This is because studies are often conducted on-site, with those who have navigated total displacement to remain recreationists in the study location or a comparable one. Limited population studies exist that aim to gather perspectives from those totally displaced as part of the sample. There is also a lack of information on the role that companions play in displacement. With recreation activities commonly being social interactions, the lack of a companion or a companion’s safety may be affecting displacement behaviors. This may contribute to disparities seen in recreation across the population and affect those who have historically been marginalized or excluded from such experiences, such as those who have lower socioeconomic status, racial and ethnic minorities, women, LGBTQIA, and non-binary individuals. It may also have a pronounced effect on those who live in multigenerational households, as recreation studies enduringly find group type is

often “with family” and these recreationists’ most easily turned to recreation companions may be of multiple ages and abilities (e.g., Shores et al., 2007; Kristensen et al., 2021; West & Merriam Jr., 1970). Studies also show that racial and ethnic minorities are overrepresented in multigenerational household living situations in the US (He & Jia, 2024; Pilkauskas et al., 2020), further demonstrating how recreation disparities and displacements overlap.

Certain recreational groups such as first-time visitors, those who are less invested in or attached to the experience, and individuals with less knowledge about recreation are more prone to total displacement (Needham & Vaske, 2013; Perry et al., 2021). Displacement is usually seen in recreationists who are more sensitive to factors like conflict, crowding, facility problems, environmental impacts, management conditions, and climate change effects (Hall & Shelby, 2000; Needham & Vaske, 2013; Perry et al., 2018a). For those who are more sensitive to these factors, the options for outdoor recreation that are in areas of low use and low conflict may be decreasing, making it imperative that managers design and maintain recreation areas that will serve diverse populations as to not lose these low use areas altogether as more people move into them (Manning & Valliere, 2001). Beyond the known information deficit regarding total displacement, the lack of social data (companion displacement) to complement our knowledge about spatial and/or temporal displacement and activity substitution is a pointed place for exploration. We suggest a new displacement type, companion displacement, is worthy of further exploration as we also expand our understanding of the other displacement types regarding recreation.

2.1.2 Spatial

Spatial displacement occurs when recreationists choose to change the site in which they are participating in recreation activities. This can be in response to overcrowding of trails, camp

sites, special features, or potential conflict. This type of displacement, when compared to temporal displacement, is a better way of relieving stress the recreator may be feeling (Fefer et al., 2021), leading to a higher quality recreation experience. This displacement can happen both within a recreation area (intra-site) – changing trails or campground but staying in the same forest – or between recreation areas (inter-site) – leaving one forest and going to a new one (or a different recreation area).

For example, in the Adirondack wilderness, visitors typically have some expectation of what they will experience on a trip, going for a hike, and if expectations are not met, they will change their location for subsequent trips or total displacement will happen (Johnson & Dawson, 2004). Visitors employed a combination of inter-site and intra-site displacement due to crowded conditions here (Johnson & Dawson, 2004), and generally inter-site displacement within a protected areas system is more common for those with place attachment to these systems of recreation areas (e.g., Vermont State Parks, National Forest System) (Manning & Valliere, 2001; Perry et al., 2021). Travel distance factors in as well. Spatial displacement may be more site related because recreationists closer to alternative sites are more aware of physical site conditions that will not change temporally (Hall & Shelby, 2000).

2.1.3 Temporal

Temporal displacement reflects the time in which recreation activities occur. This type of displacement requires recreationists to change the time in which they are engaging in an activity in a setting. For example, they could try to avoid crowds by choosing a trail during non-peak times like weekdays instead of weekends. This change in time would allow them to have the quality experience they expect when recreating, however, not everyone is able to use this coping mechanism. Those who live closer to a recreation area may find temporal displacement easier to

use based on their knowledge of the area and greater ability to change temporal patterns (Manning & Valliere, 2001). This proximity and knowledge can lead to temporal or spatial/temporal displacement, as empirical studies have found a link between experience and these forms of displacement (Hall & Shelby 2000).

For example, Johnson and Dawson (2004) found that hikers altered their schedule to weekdays instead of weekends to avoid crowds or substituted the time of year, but others were unable to change their schedule. Almost three-quarters (71%) of respondents in Johnson and Dawson's interviews used temporal displacement in combination with another displacement type. Temporal displacement can be used for ephemeral changes (e.g., crowding, drought) but not for more permanent changes (e.g., site development/modifications). This link may be beneficial regarding climate change. As weather patterns alter, largely winter activity locations may see a shift to more summer recreational activities as their winter weather season diminishes (Perry et. al., 2018a), yet traditionally summer recreation activities may be pushed to the spring and fall as recreationists cope with more summer heat, rain, and mosquitoes (Perry et al., 2018a, 2021).

2.1.4 Simultaneous spatial and temporal

It is important to recognize that spatial and temporal displacement are often co-reported. This can be seen in the work done about wilderness users (Johnson & Dawson, 2004), crowding and conflict (Manning & Valliere, 2001), visitation across sites within a state park system (Perry et al., 2018a, 2021), snowmobiling trail networks (Perry et al., 2018b), and high-use reservoirs and alternative sites (Hall & Shelby, 2000).

Wilderness recreationists have a zone of comfort or tolerance, and spatial and temporal displacement allows them to avoid nuisance management decisions (e.g., off limit areas) that

hinder their experience while remaining in their zone (Johnson & Dawson, 2004). Over 50% of respondents used either spatial or temporal displacement or both, suggesting recreationists are trying to maintain satisfaction across multiple attributes (Johnson & Dawson, 2004; Manning & Valliere, 2001). Research has found that those who used both coping strategies were the most sensitive to crowding, conflict, environmental conditions, and facility issues (Hall & Shelby, 2000). Furthermore, this sensitivity may increase with climate changes, as Perry et al. (2018a) found that any change in the current weather pattern would have recreationists changing either the location or season of visit. However, those with higher levels of place attachment were more willing to endure changed conditions or chose to recreate at the same location but at a time with perceived fewer/lesser changed conditions (e.g., camping in the fall instead of the increasingly hot summer) (Perry et al., 2021), indicating the importance of place connection to the displacement conversation.

It is important that managers understand the temporal and spatial scales considered in their areas as more recreationists expand into off-season visitation. They may need to consider strategies that would keep the low-use areas as "low-use," to avoid these areas from becoming displacement sources instead of displacement reducers (Hall & Shelby, 2000). This can include offering site alternatives during peak and non-peak times, which can reduce crowding and environmental impacts. These factors highlight the importance of continued research into spatial and temporal displacement together and separately and to include factors beyond crowding. The displacement process is a complex decision that requires tradeoffs and has constraints – available alternate sites, knowledge, time, money – that need further researching (Hall & Shelby, 2000).

2.1.5 Activity

Activity substitution is when recreationists change the leisure interest they were planning

on engaging with for an alternate one that provides comparable benefits and satisfaction (Needham & Vaske, 2013). This type of displacement has been widely studied for activities like hiking, fishing, or hunting (Needham & Vaske, 2013), but less so for other recreation activities. Substitution preferences will change in combination with temporal and spatial substitution opportunities that are available to the recreationist (Needham & Vaske, 2013), suggesting a link among these three displacement types.

Studies on activity substitution for those who hike, fish, or hunt, show that on average, half of these recreationists have other wildlife activities that they can use as replacements (Needham & Vaske, 2013). As recreationists become specialized in activities, they gain knowledge and experience which either expands substitution options or can limit the options they see as substitutes; these concepts have weak or no direct relationships (Hall & Shelby, 2000; Needham & Vaske, 2013). For example, Parry & Gollob (2018) found that when the activity is the focus of the recreation, rather than the broader motivations and outcomes that such an activity may fulfill, recreationists were less flexible in choosing an alternate activity and would instead seek out other places and times in which they could engage in that activity. Factors such as strong attachment to a site, finances, and amount of leisure time available influence when activity substitution is used (Hall & Shelby, 2000; Needham & Vaske, 2013; Perry et al., 2021; Parry & Gollob, 2018). For example, as climate change increases the temperature, water-based activities will correspondingly increase while other activities (e.g., hiking) decrease and snowmobilers may need to examine their motivations and desired outcomes and substitute different but still fulfilling winter activities (Perry et al., 2018a; Perry et al., 2018b). By understanding recreationists who will or will not substitute activities and what activities can or cannot be substituted for, managers will be able to create proper accommodation needed to keep

recreators recreating and having quality experiences (Needham & Vaske, 2013).

2.1.6 Companion

With recreation being inherently social, we introduce examination of a new form of displacement – companion displacement – in this study. We have defined companion displacement as recreationists' inability/inflexibility to engage in an experience because:

1. The risk (e.g., safety, cultural norms) of doing so alone is perceived as too great.
2. The risk is perceived as to great for more sensitive participants in their group and errs with the group.
3. The risk is perceived as to great with their current group and switches groups or recreates solo.

Thus, we have companion displacement factors that could not only shape the recreationist group composition, but also the location, timing, and activity of the experience or the decision whether to recreate at all. For example, bringing young children along for a run in a wooded area deemed appropriate only for adults might be perceived as unsafe by a recreationist, resulting in displacement by either choosing different companions, another activity, another time, and/or an alternate location. Groups of recreationists with varying degrees of physical health and stamina may encounter this frequently, as recreation decisions may be made about the most sensitive within the group (e.g., wildfire smoke and asthma, parking areas farther from the experience and those with limited mobility).

Companion displacement is based on the group (multiple people engaging together in recreation) aspect of recreation and the group size and composition influencing the desirability of alternative experiences. For example, snowmobiling is a social outdoor winter recreation activity in Vermont that is at risk due to climate change. The other, seemingly substitutable activities

could be missing the social aspect that is felt when snowmobiling (Perry et al., 2018b). The lack of this group dynamic is of reasonable concern to historically underrepresented groups in outdoor recreation, as recreating alone could be perceived as unsafe but so could recreating with a group unprepared for the conditions (Xiao et al., 2017). Searle & Jackson (1985) found that one barrier to participation was the lack of a partner, with the poor, elderly and single parents being most affected. Xiao et al. (2017) found this social aspect was a dimension of a "comfort and safety" barrier to recreation and especially pronounced for Black versus Hispanic and non-Hispanic white residents in New York City regarding urban and urban-proximate national park visitation.

Flores and Sánchez (2020) and Thomas et al. (2022) found that degraded conditions (e.g., lack of water for water-based activities, lack of trees, abundant biting insects) are unlikely to equally affect all demographic groups. This inequality can be from multiple constraints (e.g., lack of transportation, limited finances, fear of discrimination, personal safety concerns) these communities may experience when recreating in national forests, increasing disparities seen in recreation (Flores & Sanchez, 2020; Thomas et al., 2022). These disparities could be a result of the differences between minority communities compared to non-minority communities, such as increased multigenerational households. For non-minority groups, extended or multigenerational households were common during the early twentieth century but less so currently (Pilkauskas et al., 2020), but among minorities and immigrants these types of households are common and offer social support often lacking outside of their families (Kamo, 2000; Pilkauskas et al., 2020). This social aspect may be needed for a positive recreation experience, as our culture influences our behavior and recreation involvement (Krymkowski, 2021; Manning et al., 2022). This style of living is also currently popular for those who are between the ages of 25 and 34 due to factors

such as housing prices and not having a bachelor's degree (Fry, 2022). Similarly in the UK multigenerational houses are also becoming popular with young adults due to aging parents, housing costs, and the starting of families at an older age (Burgess & Muir, 2020).

Using displacement to cope with undesirable conditions is part of a recreationist's larger decision-making process (Johnson & Dawson 2004). Most research is concerned with the increase in use levels and works under the assumption that recreationists are goal-oriented, have a motive for pursuing a certain activity at a certain place and time, and have a conscious evaluation of an experience to meet their goals (Hall & Shelby 2000). This research can be expanded to look at factors other than increased use levels, such as environmental conditions like litter or site quality, noise, and motivating factors to recreate such as cultural ecosystem services.

2.1.7 Cultural Ecosystem Services

Cultural ecosystem services (CES) such as ethical values, inspiration, and connection to place, can be benefits sought, or motivators, for visitation to national forests. The leisure motivation model (Iso-Ahola, 1982) suggests that recreationists select activities that allow them to escape stress or social situations and seek out relaxation, challenges, novelty experiences, etc. (Kil et al., 2014). An extensive review of CES culminated with a list of 13 commonly sought/received CES (Gould & Lincoln, 2017) and has since been used as an analysis framework (e.g., Coleman et al., 2020). These 13 benefits are aesthetics, inspiration, bequest, cultural diversity, cultural heritage, education, existence, identity, knowledge systems, recreation, sense of place, social capital, and spirituality. It is expected that individuals will experience these CES differently based on their own life experiences and the level of place attachment they have to a specific location (Majeed & Ramkissoon, 2020; Stylidis et al., 2020). These cultural ecosystem services are also important when we think about human health and the role recreation plays.

Spending time in green spaces increases long term health and decreases morbidity (Kuo, 2015). Mental health benefits of reduced anxiety and depression and increased overall wellbeing (Lackey et al., 2021) have also been found by spending time outdoors recreating. Ecosystem services have received little attention in recreation, and specifically sparse is the use of CES as recreation motivators or displacement drivers.

In this study, we measured the types and drivers of displacement experienced by local recreationists in four heavily visited southern California forests: the Los Padres, San Bernardino, Angeles, and Cleveland. The goal of this study is to understand the extent of displacement recreationists were experiencing and how different groups, based on multigenerational household status and CES motivators, are affected by different drivers and types of displacement. If particular groups appear more sensitive to specific displacement drivers and/or types, the US Forest Service may need to consider a suite of general and targeted quality opportunities (e.g. different activities, different locations) to reduce and/or redirect displacement.

3. RESEARCH QUESTIONS

To assess the types of displacement local recreationists are experiencing and how this may change by population, (e.g. multigenerational households, motivations) we investigated two research questions. In the context of recreation in southern California national forests:

RQ_1: What form(s) of displacement, if any, have recreationists experienced?

a. What drivers are forcing displacement (e.g., extreme heat, fire risk)?

b. What types of displacement are being used (i.e., spatial, temporal, activity, total, companion)?

RQ_2: How do these drivers and types of displacement vary by:

a. Recreationists living in or not in a multigenerational household?

b. Recreationist motivations, expressed as cultural ecosystem services?

4. METHODS

4.1 Data collection

We defined "local recreationist" as Southern California adults (18 years or older) 1. residing in one of the ten counties proximate to one or more of the four national forests of interest (Los Padres, San Bernadino, Angeles, and Cleveland National Forests); and 2. having visited at least one of these four forests at least once since summer 2020. The ten local counties sampled are: Kern, Los Angeles, Monterey, Orange, Riverside, San Bernadino, San Luis Obispo, Santa Barbara, San Diego, and Ventura.

To reach these local visitors, we used a zip codes-based Qualtrics panel sample. Qualtrics is a web-based survey tool that allows surveys to be created, distributed, and analyzed (Duong, 2023). Panel surveys allow for responses from visitors beyond those who would be intercepted in on-site sampling, and at a lower cost (Perry et al., 2015). Panels proved to be an effective method to collect visitors' experiential data virtually during the COVID-19 pandemic (Taff et al., 2021).

The survey instrument was constructed and disseminated using Qualtrics software. It was available in English and Spanish to account for the diversity of languages spoken in our target area. Qualtrics compensated those who completed a quality survey. The survey was available from August 15 – November 8, 2023, resulting in 3,585 high quality responses and an additional 327 culled, low-quality responses. During that time, Qualtrics administered the panel recruitment using our invitation prompts (in English and Spanish).

We conducted two rounds of cleaning to identify low quality and automated responses, removing those that did not meet our standards for inclusion. Data validation measures in the survey also promoted data integrity (i.e., questions designed to detect spurious or automated

responses) and served as reference points for identifying suspicious responses. Beyond Qualtrics' standards for exclusion (e.g., not meeting minimum expected length of time in the survey, incomplete responses), we removed additional responses with suspicious or incongruent straight-line answers through question batteries, invalid dates of birth, invalid or non-California zip codes, and invalid open response answers (e.g., off-topic, gibberish). Although some low quality and automated responses were expected, large portions of the survey responses, especially in the Spanish version, were identified during our data cleanings and subsequently replaced by the Qualtrics team. This resulted in the survey being open longer than expected but ultimately with a response dataset of higher quality confidence.

Overall, the survey contained questions related to visitor use preferences, patterns, displacements, messaging and fatigue, risk, and demographics. For this article, we examine two themes within these data: displacement and how this varies by population. These were asked using quantitative, scaled questions (see Tables 1-4). The questions centered across these measures are whether respondents live in a multigenerational household, what motivates them to visit their favorite national forest, what conditions have ever and have most recently displaced their recreation, what forms of displacement they used.

4.1.2 Data analysis

Data analysis was via IBM SPSS statistical software version 28.0. Descriptive statistics were processed on respondent demographics. Demographic questions included gender and race/ethnicity. Descriptive statistics identified the drivers of displacement experienced which included those that were experienced but did not affect respondents plans, experienced and affected respondents plans, not experienced ever, and most recently experienced by respondents (Figure 1). They also provided insight on the types of displacement utilized during respondents

most recent experience and the drivers associated (Table 2).

Once completed, CES motivators of recreation were examined using an exploratory factor analysis (EFA) to group the variables based on their underlying relationship. The two factors created explain 53.9% of the total variance. A reliability analysis was performed for both factors identified. This ensured responses were consistent regarding the variables measuring our latent concepts by using Cronbach's alpha reliability coefficients (Vaske, 2008). The Knowledge (factor 1) and Place-based (factor 2) Cronbach's alphas were .88 and .79, respectively. A K-means cluster analysis was then completed on the two factors, resulting in a group of respondents who centered Knowledge-related CES motivations and a group of respondents who centered Place-based CES motivations in their forest visitation. Cluster analysis categorizes responses into groups maximizing similarities within and differences between clusters (Vaske, 2008). This is done by using multiple variables so we can differentiate the clusters. Measuring distance from the center of a cluster in Euclidean space, K-means clustering can determine the similarity or dissimilarity of variables (Benson et al., 2013). Finally, a Chi-square analysis was completed comparing drivers and types of displacement to those living in multigenerational households and CES motivators for recreation.

5. RESULTS

Overall, 3,585 high quality responses were retained to use as our total sample size. Of these, 50.4% of respondents identified as male; 47.9% as female; and 1.7% as non-binary, prefer not to say, or other. In terms of racial diversity and ethnicity, respondents chose non-exclusive categories in the following frequencies: white (66.5%); other (11%); Black or African American (10.4%); Asian (8.4%); and American Indian or Alaskan Native, prefer not to say, and Hawaiian or Pacific Islander totaling 9.8%. One-third (32.5%) of respondents identified as Hispanic,

Latino/a, or Spanish origin.

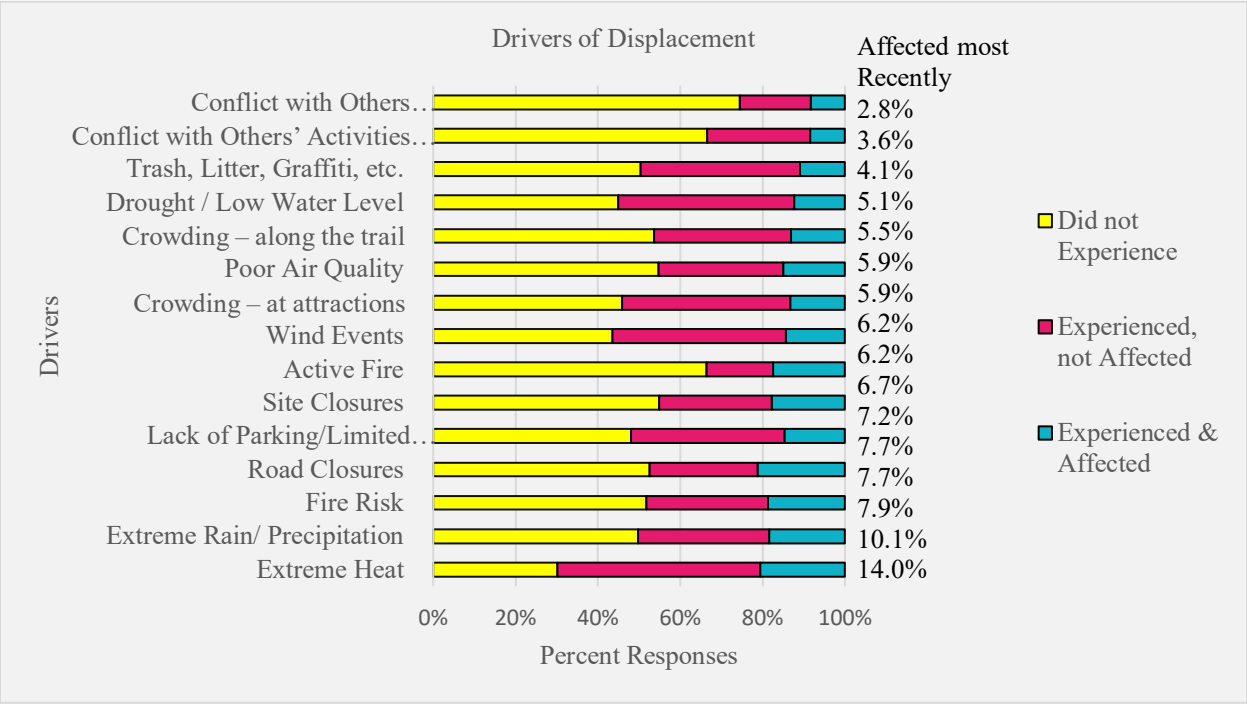
RQ1: What form(s) of displacement, if any, have recreationists experienced?

a. What drivers are forcing displacement (e.g., extreme heat, fire risk)?

b. What types of types of displacement are being used (i.e., spatial, temporal, activity, total, companion)?

Respondents were asked to identify drivers (e.g., extreme heat, crowding, lack of parking) of displacement that they had: never experienced, experienced at least once but it did not affect their plans, or experienced at least once and it affected their recreation plans. For any given driver of displacement, one-third to three-quarters of respondents (30.2% to 74.5%) indicated that they had *not* experienced this condition. Conflict with others was the least experienced (74.5%; i.e., 25.5% having experienced conflict with others at some point). For any given driver experienced, 16.2% to 49.3% of respondents indicated that although they had experienced it, it did *not* affect their plans. Extreme heat was the most commonly experienced but not affecting plans (49.3%). Finally, for any given driver experienced, 8.3% to 21.2% of respondents indicated that it had *affected* their plans. Road closures was the most commonly experienced displacement driver that affected plans (21.2%). A follow-up question asked respondents to indicate their most recent experience with a displacement driver. Responses ranged from 2.8% to 14.0% for any given driver, with extreme heat (14.0%) the most commonly chosen (Figure 1).

Figure 1. Drivers of displacement respondents have never experienced, experienced during recreation that either did or did not affect their plans, and their most recent driver affecting plans.



Looking across drivers for each displacement type, the largest driver of displacement is extreme heat. This driver has the largest percentage consistently for all displacement types, ranging from 21.2% to 39.0%. An exception was 'recreating with fewer people with limitations', where wind events have the highest percentage (26.9%) (Table1). Overall, spatial, temporal, and total displacement are driven by a narrower set of drivers. Spatial displacement is influenced by the first seven drivers in Table 1, extreme heat to active fire, while temporal is influenced by the first nine, extreme heat to crowding at attractions. Total displacement by choosing an entirely different experience and total displacement by canceling all plans are influenced by the first three and the first four drivers, respectively. Activity substitution and companion displacement, however, are influenced by a broader set of drivers: activity substitution ranging from extreme heat to poor air quality and companion ranging across the drivers (Table 1).

Looking across displacement types for each driver, focusing only on the six types of

displacement highlighted in grey in Table 1, three of the six have specific drivers associated. The 15 drivers are grouped in either total displacement with the cancelation of all plans, spatial displacement, or companion displacement, with companion displacement having the largest number of drivers. The first four drivers, extreme fire, extreme rain, fire risk, and road closures influence a higher percentage of people (21.4% to 29.7%) to cancel their plans completely. Lack of parking and site closures displace more recreationists spatially, 16.0% and 16.9% respectively. The last nine drivers, active fire to conflict with others, drive more recreationists to change the companion they are recreating with, at rates of 11.2% to 18.0% (Table 1).

Table 1. Types of displacement (general in grey rows; specific within these in white rows) for most recent driver experience Percentages for general and specific types of displacement exceed 100%, as respondents could choose multiple answers.

	Drivers														
Displacement Type	Extreme Heat	Extreme Rain /Precipitation	Fire Risk	Road Closures	Lack of Parking /Limited Available Parking	Site Closures	Active Fire	Wind Events	Crowding at attractions	Poor Air Quality	Crowding along the trail	Drought / Low Water Level	Trash, Litter, Graffiti, etc.	Conflict with Others' Activities (hiking & Mt. biking on same trail)	Conflict with Others (Discrimination, Harassment, etc.)
Spatial	**24.6**	**16.0**	**15.1**	**16.9**	**16.0**	**16.9**	**14.8**	**13.4**	**13.1**	**11.5**	**12.2**	**10.4**	**9.9**	**7.9**	**6.1**
Different site, same forest	26.7	17.3	15.2	15.5	16.6	16.4	14.8	14.8	14.5	11.5	12.9	11.9	11.2	9.6	6.6
Different national forest	26.9	23.7	19.4	14.3	15.8	17.6	20.8	18.3	15.1	15.8	15.1	15.4	12.2	11.5	9.7
Different outdoor recreation location (city park, etc.)	32.5	14.3	16.9	17.7	14.8	16.5	16.0	13.1	13.9	12.7	15.6	13.5	10.5	7.6	9.3
Temporal	**27.3**	**17.9**	**12.0**	**12.0**	**14.5**	**8.9**	**10.8**	**11.1**	**11.2**	**10.8**	**11.0**	**9.9**	**8.2**	**7.5**	**5.5**
Different time of day	32.7	17.1	9.3	10.8	14.7	10.5	10.5	10.2	16.2	9.6	15.6	11.1	8.7	10.2	7.5
Different day of the week	25.4	20.1	12.0	13.2	14.5	10.2	14.8	14.2	10.4	13.2	12.0	10.2	7.9	9.9	6.1
Different month	24.6	21.7	15.4	9.2	12.5	8.8	13.6	14.7	10.7	12.9	12.1	15.1	8.8	10.7	8.5
Different season / time of year	26.4	22.9	15.2	13.4	14.3	9.5	14.3	12.6	13.0	12.6	12.1	12.1	11.7	11.7	7.8
Changed amount of time spent there	30.4	14.2	12.1	17.9	12.1	10.0	7.5	12.1	13.8	10.4	11.7	8.8	11.3	4.6	2.9

Table 1 (cont'd)

	Drivers														
Displacement Type	Extreme Heat	Extreme Rain /Precipitation	Fire Risk	Road Closures	Lack of Parking /Limited Available Parking	Site Closures	Active Fire	Wind Events	Crowding at attractions	Poor Air Quality	Crowding along the trail	Drought / Low Water Level	Trash, Litter, Graffiti, etc.	Conflict with Others' Activities (hiking & Mt. biking on same trail)	Conflict with Others (Discrimination, Harassment, etc.)
Activity	**29.2**	**19.9**	**13.4**	**10.6**	**12.4**	**11.3**	**11.9**	**14.4**	**13.7**	**13.4**	**12.2**	**12.9**	**9.9**	**9.3**	**7.6**
Land-based to water-based activity	39.0	23.2	15.1	7.3	17.8	11.2	14.7	16.6	17.4	14.7	16.2	14.3	9.7	12.0	11.2
Land-based to a different land-based activity	24.3	22.7	15.1	11.5	11.2	11.0	12.5	15.7	13.3	14.6	11.1	11.7	10.2	11.2	7.8
Water-based to land-based activity	29.5	27.8	13.1	8.9	13.5	12.2	16.9	17.3	20.3	16.0	18.1	24.1	12.2	14.3	10.5
Water-based to a different water-based activity	24.7	23.7	13.2	10.0	13.2	15.8	15.3	18.4	21.1	17.9	17.9	14.7	11.1	13.2	16.8
Changed the level of challenge	36.0	14.0	14.0	12.2	14.7	13.4	7.9	15.9	10.4	14.6	13.4	11.0	11.6	7.3	4.9

Table 1 (cont'd)

Displacement Type	Drivers														
	Extreme Heat	Extreme Rain /Precipitation	Fire Risk	Road Closures	Lack of Parking /Limited Available Parking	Site Closures	Active Fire	Wind Events	Crowding at attractions	Poor Air Quality	Crowding along the trail	Drought / Low Water Level	Trash, Litter, Graffiti, etc.	Conflict with Others' Activities (hiking & Mt. biking on same trail)	Conflict with Others (Discrimination, Harassment, etc.)
Companion	**22.7**	**21.1**	**12.5**	**9.9**	**13.8**	**11.0**	**16.2**	**17.8**	**14.9**	**14.6**	**17.2**	**18.0**	**11.2**	**16.2**	**11.5**
Decided to recreate alone	30.6	26.4	14.0	9.9	15.7	14.9	20.7	19.8	15.7	19.0	19.0	24.0	14.0	19.0	14.0
Decided to recreate with others	25.5	23.0	11.8	12.4	13.0	11.8	17.4	21.1	15.5	16.1	18.6	18.6	12.4	18.6	11.8
Recreated with a smaller group	22.6	21.0	15.4	9.2	15.9	11.3	19.0	21.5	16.4	14.9	18.5	21.0	12.8	16.9	15.9
Recreated with a larger group	23.0	21.6	10.8	9.5	14.2	10.8	17.6	18.2	18.2	16.9	23.6	20.3	12.8	21.6	10.8
Recreated with a group with more experience	25.9	21.1	12.4	7.6	15.7	10.3	21.1	22.7	16.2	13.5	18.4	23.2	14.6	17.8	14.6
Recreated with fewer children in the group	25.7	17.4	9.2	11.0	13.8	12.8	12.8	15.6	15.6	10.1	22.0	21.1	16.5	17.4	10.1
Recreated with fewer people with limitations (mobility, health conditions)	21.2	23.1	13.5	15.4	15.4	13.5	17.3	26.9	15.4	15.4	13.5	17.3	15.4	13.5	21.2
Total – Chose a different experience	**26.4**	**20.8**	**16.2**	**17.4**	**14.6**	**14.1**	**14.4**	**14.4**	**12.0**	**10.6**	**15.0**	**9.5**	**10.9**	**8.1**	**7.4**
Total – Cancelled all plans	**29.7**	**24.2**	**22.9**	**21.4**	**7.6**	**16.8**	**12.5**	**10.1**	**4.3**	**10.7**	**4.9**	**4.6**	**4.3**	**2.1**	**2.4**

RQ2: How do these drivers and types of displacement vary by:

a. Recreationists living in or not in a multigenerational household?

b. Recreationist motivations, expressed as cultural ecosystem services?

Cultural ecosystem services are an evolving concept with numerous ways to ask questions regarding these benefits. With no established list of questions, but a core set of agreed upon CES, we used the list of CES from Gould and Lincoln (2017). An exploratory factor analysis was conducted on these 15 CES to ascertain potential factor groupings (versus a Confirmatory Factor Analysis for established questions/approaches) (Table 2). This EFA simplified the CES into two factors, which hung together well with Cronbach's alpha of .88 and .79, respectively. 53.9% of the total variance is explained by these two factors. These factor names were chosen as the first factor focuses on learning about a location whereas the second factor focuses on what one can do or receive at a location. Refinement of the names is still in progress. We then conducted a K-means cluster analysis to understand how segments of our population may have different levels of agreement with the CES variables comprising these two factors motivating their national forest visitation.

Table 2. Cultural ecosystem services exploratory factor analysis resulting in two groups.

Motivation/Cultural Ecosystem Service	Factor Loading	
This forest provides me with the opportunity to…	Factor 1: Knowledge	Factor 2: Place-based
Different ways of knowing – traditional knowledge systems	.77	
Reflect on different ways of knowing / cultural practices	.76	
Connect to traditional places / ways of life	.75	
Inspired to create art	.72	
Social relationships	.70	
Learn about the setting/ its environmental processes	.65	
Greater understanding of myself in relation to the setting	.65	
Connect to forces / spirituality	.59	
Spend leisure time outdoors		.77
Appreciate beauty		.74
Physical / mental health benefits		.64
Deep sense of connection to the setting / geography		.63
Satisfied knowing the setting is protected		.58
Conservation value for future generations		.51
Eigenvalue	4.55	3.00
Percent (%) of total variance explained	32.5	21.4

Two clusters appeared to have the most distinction within the CES considerations, considering the strength of agreement on a 5-point Likert scale. Both clusters agree with knowledge CES adding to their motivations to visit the forest. However, the cluster that expressed more agreement with knowledge CES motivations also agreed with place-based CES motivations, whereas the other cluster expressed less agreement with the place-based CES motivations. We therefore named and used these two clusters for the remainder of the analysis:

- Knowledge: those who go to a setting to learn more about themselves; *M*= 3.50 Knowledge motivations, *M*=2.78 Place-based motivations, n=1591, 44.4%
- Knowledge & Place-based: those who go to a setting to learn more about themselves and feel a connection with the place; *M*= 4.44 Knowledge motivations, *M*= 4.13 Place-based motivations, n=1995, 55.6%

Finally, a chi-square analysis compared the drivers and types of displacement between those who do or do not live in a multigenerational household and between the two clusters of

motivating CES. Of the 15 examined drivers of displacement, all were experienced more by those in multigenerational households and nine significantly so, and four of the five displacement types followed the same pattern (i.e., all except canceling all plans, which is not significantly different between groups) (Table 3). Percentages ranged from 3.9 to 15.9, with extreme heat being the largest driver for displacement of recreationists from within multigenerational households (p = .009, V = .044). Two of the significant types of displacement for recreationists from multigenerational households are small to medium with effect sizes of V = .114 and V = .115 with the other three less than 0.10. Of the 15 examined drivers of displacement, 13 were experienced and seven significantly so (Table 3). Total percentages ranged from 2.8 to 14.0 for the two clusters with extreme heat being the largest driver for both factor (p = <.001, V = .074) (Table 4). Significant drivers had a small effect size, less than 0.10, as well as the significant CES types of displacement (Vaske 2008).

Table 3. Drivers and types of displacement experienced by those living in a multigenerational household and the two motivation cultural ecosystem services (CES) groups.

Drivers & Types	Multigenerational Household					CES				
	Yes	No	Total	p	V	Knowledge	Knowledge & Place-based	Total	p	V
Extreme Heat	15.9	12.8	14.1	.009	.044	11.1	16.3	14.0	<.001	.074
Extreme Rain/ Precipitation	12.2	8.5	10.1	<.001	.059	7.9	11.8	10.1	<.001	.066
Fire Risk	8.7	7.4	7.9	.161		6.2	9.2	7.9	<.001	.057
Road Closures	7.9	7.5	7.7	.696		7.9	7.5	7.7	.655	
Lack of Parking/Limited Available Parking	7.8	6.4	7.0	.109		6.5	7.7	7.2	.172	
Site Closures	7.8	5.9	6.7	.032	.036	6.6	6.8	6.7	.796	
Active Fire	7.8	5.3	6.3	.003	.051	4.2	7.9	6.2	<.001	.075
Wind Events	8.1	4.6	6.1	<.001	.073	5.1	7.1	6.2	.014	.041
Crowding - at attractions	6.8	5.0	5.8	.018	.040	5.0	6.6	5.9	.041	.034
Poor Air Quality	6.5	5.5	5.9	.194		5.1	6.6	5.9	.061	
Crowding – along the trail	6.1	5.0	5.5	.155		4.8	6.1	5.5	.096	
Drought / Low Water Level	6.6	4.1	5.2	<.001	.057	5.0	5.3	5.1	.688	
Trash, Litter, Graffiti, etc.	4.8	3.6	4.1	.090		3.7	4.4	4.1	.290	
Conflict with Others' Activities (hiking & Mt. biking on same trail)	5.3	2.3	3.6	<.001	.081	2.6	4.3	3.6	.007	.045
Conflict with Others (Discrimination, Harassment, etc.)	3.9	1.8	2.7	<.001	.064	2.2	3.3	2.8	.053	
Spatial	21.9	16.4	18.8	<.001	.070	15.0	21.7	18.7	<.001	.085
Temporal	31.7	21.6	26.0	<.001	.114	24.1	27.3	25.9	.033	.036
Activity	22.3	17.1	19.4	<.001	.066	16.4	22.0	19.5	<.001	.070
Companion	14.7	7.6	10.7	<.001	.115	10.2	11.0	10.7	.450	
Total – Chose a Totally Different Experience	14.7	10.0	12.0	<.001	.071	11.6	12.4	12.0	.428	
Total – Canceled all Plans	8.1	9.7	9.0	.122		10.2	8.2	9.1	.037	.035

6. DISCUSSION

To decrease and/or positively redirect the amount of displacement in national forests, we

must understand what types of displacement are experienced by the recreationists visiting these forests and consequently how they have changed their plans. With each examined driver affecting at least around a fifth of respondents' recreation plans, Figure 1 and Table 1 provide a touchstone to consider how to respond with appropriate messaging, especially in the face of climate change, to offer a quality experience. Tables 2 and 3 further guide us in this regard with respect to two distinct populations, those who live in multigenerational households and people motivated by knowledge or knowledge and place-based CES to visit.

Extreme heat generally overshadowed the other displacement drivers. This is unsurprising when considering the Mediterranean climate of southern California already offering warm days year-round for recreation, but is concerning regarding the predicted climate changes. As climate change-induced extreme heat is already affecting recreation decisions, this will prompt more frequent recreation plan changes as the days become hotter for longer stretches (Kim et al., 2021), potentially pushing more total displacement and canceling of plans. This is especially worrying for those who have health conditions, as they are often more affected by extreme heat than other groups (Kim et al. 2021; Orimoloye et al., 2019). That is, unless we can offer a quality experience based on recreationists' flexibility to change their plans.

Some flexibility can be found in the ways recreationists are coping with displacement, but that flexibility is not even across all types of displacement. People are generally tied to where they are recreating, as expectancy theory suggests, as we know the desired outcomes and value the location (Manning, 2022; Parry & Gollob, 2018). Overall, recreationists in our study are willing to change the inner bubble of the what (activity) and the who (companion) but are not as flexible on the where (spatial) and the when (temporal). This can be seen in Figure 1, with only a few of the drivers pushing recreationists out of their desired location to a substitute. Temporal

displacement has similar findings as spatial, with temporal fidelity to a location, but crowding is now pushing recreationists to change the time of day they are recreating. This fidelity is not seen for activity substitution or companion displacement.

Numerous drivers are affecting the activity changes and companion changes taking place. These recreationists are willing to change their activity to have a quality experience across ten different drivers. It is possible that we surveyed a more generalized activity audience with willingness to change activities across different drivers or these data complicate past literature suggesting that greater activity specialization can either give new opportunities or limit opportunities for substitutable activities (Hall & Shelby, 2000; Needham & Vaske, 2013; Parry & Gollob, 2018). When it comes to who recreationists are recreating with, our results suggest that this decision is impacted across all 15 drivers, making these recreationists easily displaced but flexible on with whom they recreate. This group of recreationists is choosing alternative companions based on the site conditions to keep their companions with them, potentially employing an ethic of care in recreation, as their companions are vital to their recreation experience. For example, conflict with others has recreationists recreating with fewer people with mobility issues and crowding along the trails has recreationists choosing groups with fewer children. This is a new concept that warrants further exploration, as we are making important progress in this area but have yet to discern strong patterns in the data.

Understanding the main drivers and the types of displacement experienced allows us to consider how managers can use this information in new messaging strategies. With respondents being more willing to change who they are recreating with or the activity they are engaging in, messages should focus on offering opportunities that keep spatial and temporal changes at a minimum. An example could be offering a different trail of similar challenge within the same

forest that can be completed in a similar time frame as one that may be crowded or closed. Another consideration for message creation are the benefits recreationists are trying to gain from their visit. Our work on CES-related motivations (Tables 2 and 3) and groupings of respondents as seeking knowledge or knowledge and place-based outcomes speaks to this. If a message is focused on the knowledge and place-based CES benefits (Table 2), these messages will resonate with a larger audience than if the messages singularly focus on just one of these. However, knowledge-based motivations would be the transcending theme to appeal to both groups about displacement drivers and options, whereas adding the place-based messaging might appeal particularly to a subset of recreationists. This broad targeting for knowledge motivations is important as these messages may not need as much time or energy to create, leaving more time to focus on messaging targeted groups.

With at least 15% of recreationists living in multigenerational households employing one or more coping mechanisms through displacement, who someone lives with influences what drivers and types of displacement they experience most (Table 3). Spatial, temporal, and activity substitution are felt significantly more by recreationists living in a multigenerational household and by those who have more encompassing CES motivators for visitation (knowledge and place-based). Companion and the two total displacements are experienced more by those in multigenerational households and those with less encompassing CES (knowledge), respectively (Table 3). Targeted messaging could be created to reduce companion and total displacement that focus on those with less encompassing CES motivators and those living in multigenerational households. For example, offering a trail that is low difficulty, as we know multigenerational households have both older and younger adults, this would allow for all companions to potentially be involved. This could reduce the displacement of two specific groups while the

broader messaging talked about in the previous paragraph would reach the other larger audience of recreationists covering all bases. Beyond messaging, this assists managers in knowing how recreationist composition may change when one or more of the displacement drivers are present, which is key especially in a weather volatile and heavily populated area like southern California.

As suggested by previous literature (e.g., Flores and Sanchez, 2020; Kamo, 2000; Krymkowski, 2021; Manning, 2022; Perry et al., 2018b; Searle and Jackson, 1985; Thomas et al., 2022), companions in recreation are important factors influencing recreation behaviors, but not all demographic and cultural groups are affected equally. Those living in multigenerational households are often minority or immigrant groups who seek social support from within their families (Kamo, 2000) and need to have this social aspect for a positive recreation experience (Krymkowski, 2021). Our work supports these findings, as those living in multigenerational households are significantly affected by all types of displacement and are the only group studied affected by companion displacement (Table 4). Further, looking across drivers, companion displacement is highly affected by all 15 drivers of displacement, ranging from 9.2% to 30.7% of respondents affected. Creating messages with this in mind will be vital to reaching an entire recreation population who hold their companions in high regards during recreation decisions.

7. CONCLUSION

The results of this survey show that southern California recreationists of the Los Padres, San Bernardino, Cleveland, and Angles National Forests are being displaced by a range of drivers and all types of displacement are being used as coping mechanisms for a quality experience. Extreme heat is the most noted driver both generally and by the two populations delineations we examined. Support for a fifth type of displacement, companion displacement, was found with large percentages of the respondents using this coping mechanism and all drivers

influencing it. With two clusters of CES motivators appearing in the data, knowledge or knowledge and place-based, recreationists are visiting forests for different reasons meaning messages will have to consider these groups to have the best effect.

Better messages will have to be created and varied (e.g., different framing, targeting specific groups) to reduce or positively redirect displacement in the four national forests. This will be tricky for managers as they consider the willingness to change, in the case of spatial and temporal displacement, and with whom and in which activities. Furthermore, the social displacement of companion displacement needs to be incorporated so as not to neglect a whole population of recreationists. Creating messages focused on the groups with the broadest motives for visiting, knowledge and place-based, will hopefully reach the largest audience. Effort might be best put to reach those being affected by companion displacement and total displacement as those were experienced significantly only by those in multigenerational houses and the narrower CES motivations group. While displacement may not be life or death – play or peril – keeping recreationists engaged in forest visits is crucial to keeping our national forests open, available, and relevant for our recreation pursuits, as these areas are only as important and stewarded as the public considers them to be.

8. LIMITATIONS AND FUTURE DIRECTIONS

We asked about the multiple drivers of displacement and for respondents to consider their most recent experience with these drivers. Because displacement literature is still scant and unconnected, we attempted to get a broader view to understand drivers better. By asking for their most recent experience, we are unable to know what frame "recent" was. Respondents could have been thinking of multiple visits as recent. For future surveys this should be changed to either only allow one driver to be selected instead of multiple or a definition of recent should be

given to frame the question more clearly.

Chapter 3: Are southern California recreationists fire-tired? Exploring message fatigue and perceived risk levels of national forest visitors.

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ABSTRACT

California residents receive copious information regarding wildfires (fires) each year, especially during fire season. Climate change is expected to influence the severity and frequency of fires, potentially increasing the amount of fire messaging residents receive. This may lead to residents experiencing message fatigue, potentially influencing their perception of risk associated with fires. If more messaging is received by fatigued visitors, this may result in risky recreation due to messages not resonating. To guide would-be visitors to suitable alternative recreation experiences due to wildfire conditions, a better understanding of their information sources, perceived fire risk, and fire-related message fatigue is needed. We conducted a survey in 2023 of southern California residents who recently visited at least one of the four forests in the study area (Los Padres, San Bernardino, Cleveland, and Angeles National Forests). Our results showed that message fatigue was found to play a role in the risk perceptions visitors were associating with times of fire or fire risk. Four different fatigue levels were found: less fatigued and high information frequency, less fatigued and less information frequency, somewhat fatigued and moderate information frequency, and most fatigued and low information frequency. As fatigue levels increased, the perceived risk associated with times of fire decreased. Understanding and reducing message fatigue is important, as visitors' lack of responsiveness may put them at increased risk. The US Forest Service will need to be cognizant of this fatigue as they think about new messaging during times of fire as to have the intended affect.

Keywords: Risk perception, Recreation, USDA Forest Service, Wildfire

1. INTRODUCTION

In national forests, the safety of visitors (also called users or recreationists) is of paramount importance to managers. Visitors' primary source of safety information is signage within the forests (Saunders et al., 2019). There are other ways to promote the safety of visitors – fencing and barriers, for example. However, the most preferred way is through persuasive communication that influences their behaviors (Saunders et al., 2019), as more permanent features (e.g., fences, barriers) can disrupt the visitor experience (Marion & Reid, 2007). Persuasive communication takes place via a central or peripheral route to persuasion (Marion & Reid, 2007; Miller et al., 2018). The central route results in long-term adoption of changes, as it allows the visitors to draw on previous experiences and knowledge to evaluate what the message is trying to convey and deals with message relevancy (Marion & Reid, 2007; Miller et al., 2018). The peripheral route results in short-term adoption, as it relies on visitors being interested in who is giving them the information instead of the information itself (Marion & Reid, 2007). For example, an authority figure or famous person could be used as the face of a campaign. The central route is preferable, but it is not the way most people make decisions, as we have limited cognitive capacity and save it for important situations (e.g., life-or-death, risk) (Miller et al., 2018). To put it another way, when making decisions we put in as little effort possible by relying on intuition instead of thinking analytically, we become cognitive misers (De Neys et al., 2013).

Message fatigue adds to the difficulty of keeping visitors safe through different messaging formats, where individuals become burnt out from receiving or interacting with messages on a topic resulting in behavioral changes that reduce uptake of information (Mackie 2014; Reynolds-Tylus et al., 2021; So et al., 2017). To put into perspective the amount of information an individual is consuming daily (texts, emails, phone calls, newspapers, media,

conversations, etc.), Kabachinski (2004) states, “The weekday edition of the New York Times has more information than the average 17th-century person would come across in a lifetime.” While this increase in information has resulted in a multitude of health issues including increased stress levels and memory difficulties (Kabachinski, 2004), it also could create a problem for agencies such as the US Forest Service in southern California during times of risk events, such as wildfires. Visitors experiencing message fatigue may also experience an attenuated perception of risk (Kasperson et al., 2022; Mackie, 2014). This change in risk perception has the potential to put these visitors at an increased risk that could have been avoided if message fatigue was better managed regarding wildfires or wildfire risk.

2. LITURATURE REVIEW

When it comes to understanding and communicating about risk in recreation settings, managers are often challenged by visitors’ limited understanding of how serious risk can be (Saunders et al., 2019). This is especially true when visitors are visiting areas that are unfamiliar and/or unpredictable, as they tend to be more accustomed to the diminished risk in more developed and frequented locations. Communication is also made more difficult by distractions such as a visitor’s prior attitude and/or knowledge toward the topic, other visitors around them, and repetition of a message (Wiles & Hall, 2005). Repetition of a message or similar topic messages can result in message fatigue. Message fatigue, warning fatigue, the cry-wolf effect, and the many other names given to this idea of repeated messages, is the result of the continued interaction with messages on a specific or general risk topic that might or might not take place (Mackie 2014; Reynolds-Tylus et al., 2021; So et al., 2017).This ultimately results in individuals becoming unmotivated to engage with or act in accordance with the message (Mackie 2014; Reynolds-Tylus et al., 2021; So et al., 2017). Seo et al. (2021) defines message fatigue as “a

primary type of unintended resistance among recipients during message exposure." This unmotivated state results in unwanted outcomes for the managers sending the messages (So et al., 2017). In the case of southern California, frequent messaging regarding wildfires may create this fatigue or exhaustion. If individuals are overexposed to warning messages, they may become desensitized to the risk associated with the hazard, resulting in individuals potentially putting themselves in harm's way (Mackie, 2014). Ultimately, this has the opposite effect than intended by the messengers.

2.1 Message fatigue in health communication

Recently, research has looked at COVID-19 and effects of message fatigue in relation to the level of risk the public associated with the pandemic (Mao et al., 2022). When news media outlets overloaded watchers and listeners with information on COVID-19 prevention, spread, and hospitalizations, some individuals adopted a message fatigue response leading to low motivation to process this information (Mao et al., 2022). Individuals were not motivated to process the constant inflow of COVID-19 information because they had continual access to the most recent messages (Mao et al., 2022). This constant messaging reduced the risk individuals attached to the virus, resulting in reduced acceptance of preventative measures over time (Mao et al., 2022). This fatigue may decrease self-protective behaviors. Recreation settings like US state parks engaged in a variety of COVID-19 messaging and visitor safety behaviors (Perry et al., 2021), which may have added to the information saturation of visitors and reduced their perceptions of risk and needs for compliance.

This corroborates what Mackie (2014) found regarding shock tactic health messages. These frequent shock tactic health messages involve a concerning health risk aligned with a percentage, such as "33% of people could die," framed to "scare" the recipient into becoming

healthier. Yet, Mackie (2014) found this did not have the intended effect and individuals started ignoring these messages. Similarly, other research on health messages (e.g., Peters et al., 2007; Seo et al., 2021; So, 2022) suggests message fatigue can create psychological reactance, or active resistance, to repeated health messages, resulting in individuals feeling a loss of their freedom to choose their own behaviors. Seo and colleagues also found that individuals were more likely to accept a higher level of risk due to their indifference to the messages, having adopted a 'this can't happen to me' thought process (Bodemer & Gaissmaier, 2015). Evans et al. (2017) found similar results with graphic warning labels on cigarette containers reducing risk perceptions of smoking if this warning did not elicit a strong emotional reaction. This thought process is also more common in adults than adolescents, as children associate higher risk with such things as natural disasters and death (Bodemer & Gaissmaier, 2015). Higher message fatigue can increase resistance and result in a lower rate of acceptance of the recommended behaviors (Kim & So 2018; So & Popova, 2018).

So and Alam (2019) revealed an inverse relationship: with greater fatigue from messages, the less an individual has relevant thoughts when exposed to that message. This poses distinct difficulties for agencies that manage recreation, as education and engagement through messaging is often their initial, main, and sometimes only, form of communicating information (e.g., Greiner et al., 2023; Twarkins et al., 2001). With message fatigue creating higher levels of risk acceptance, reduced self-protective behaviors, unreasonable optimism, and lowered attention / relative processing (Seo et al., 2021, Mao et al., 2022, Mackie 2014), visitors could be putting themselves at risk without conscious awareness of doing so.

2.1.2 Risk communication in the context of wildfire

To avoid visitors putting themselves in harm's way, the US Forest Service is increasingly

closing forests completely to recreation / visitation during times of high fire risk or active fire. This creates a recreation displacement problem and could also contribute to message fatigue as wildfire messaging frequency increases during these times even in absence of actual wildfire. Although the closures may keep people safe (if abided), message fatigue may alter visitors' responses to such closures. This necessitates timely messaging to avoid message fatigue. To protect visitors, park managers must create messages that cut through fatigue and resistance to achieve their intended effect. This goes beyond informing visitors of closures, the risks involved in recreation during these times, and alternative recreation opportunities. The goal of these messages is to keep visitors visiting and using the forests, but more importantly keep visitors safe and risk-aware while doing so. Breaking through this fatigue can be challenging with the amount of information individuals interact with daily at work and during times of leisure.

Using the most appropriate information dissemination source is especially important in combating message fatigue. If sources are being overtly ignored or avoided, then different strategies (e.g., those suggested by So et al., 2017) and information sources are needed to break through the fatigue to keep visitors aware of potential risks at any given time. Having data on where visitors are going for up-to-date information allows the US Forest Service to tailor messages for the greatest impact for each source. Li & Xie (2020) found that the presence of an image created better interaction with Twitter (X) users when attached to a post, and additionally, if the image was of high-quality, interaction on a post increased for both X and Instagram. Therefore, images posted on a social media platform would be of better quality than pictures printed on a flyer for a trailhead board, creating better interaction with the messages being presented. It is important to note social media is used by a non-specific audience whereas physical messaging in a national forest would be used by the target audience of forest visitors.

These types of considerations should go into the process of message creation to reduce message fatigue.

2.1.3 Study area

California residents and forest visitors confront frequent partial forest closures due to the state's large number of wildfires and other hazards such as flooding or extreme heat. As a changing climate is increasing the number of wildfires, residents will likely endure even more forest closures and more frequent exposure to fire messages, potentially leading to further dismissal of the risks. This potential for increased messaging is apparent in numerous websites dedicated to sending fire-related messages just in this area, including the Bureau of Land Management, CAL FIRE, California Fire Safe Council, and the US Forest Service. Interacting with fire messaging can be either voluntary (e.g., self-selected mailing list) or involuntary (e.g., emergency alerts) and easily overwhelming due to each source having fire risk information available and / or sending out fire-related information. This can either be sent directly to individuals via email lists (e.g., CAL FIRE newsletter) or via broad messages seen on social media (e.g., US Forest Service Facebook). The ratio of messaging to fatigue varies by individual and influencing factors such as information overload (Mao et al., 2022).

Although research on message fatigue is longstanding, relating it to the context of fire seems to be relatively understudied. For example, the first three to five pages of results from a google scholar peer-reviewed search for the term 'message fatigue' brings up articles on COVID-19 messaging, anti-tobacco messages, and generalized coping strategies for information fatigue (e.g., Kabachinski, 2004; Mao et al., 2022; So, 2022), 'warning fatigue', and 'disaster warning fatigue' searches on google scholar result in one article pertaining to warning fatigue regarding Australian bushfires (Mackie, 2014) and the next five pages referencing driving while

fatigued. Mackie (2014) found that the more warning individuals received about a potential situation that ultimately did not occur, the more burnt out and indifferent they were to these messages thereon. This reduced the risk associated with future warnings and changed individuals' levels of risk perception (Mackie, 2014). Mackie (2014) also found five main components of message fatigue: untrustworthy message sources, feelings of helplessness from receiving messages regarding imminent disasters, many false alarms lacking explanation from a trusted source, too many warnings too far in advance of a disaster, and skepticism resulting from a combination of the other factors. However, we do anecdotally know that message fatigue for slow-moving and/or potential catastrophes – climate change is a prime example – exists in contexts beyond those reported and would expect it to be pronounced in the nexus of fire risk and forest.

While the US Forest Service does conduct surveys every 5 years in select locations, these surveys are focused on general visitor information, not perceptions of messages and/or risk. The latest NVUM (National Visitor Use Monitoring) assessment for the Los Padres National Forest conducted found that of visitors surveyed, 58.5% of identified as male, 90.4% as white, and 15.8% as Hispanic/Latino (USDA Forest Service, 2019a). Similar results were found for San Bernardino, Cleveland, and Angeles National Forests, with 60.1%, 60.9%, and 62.2% of visitors identifying as male; 88.5%, 88.7%, and 70.7% of as white; and 31.3%, 21.6%, and 33.2% as Hispanic/Latino, respectively (USDA Forest Service, 2019b; USDA Forest Service, 2019c; USDA Forest Service, 2016).

2.1.4 This study

In this study, we measured message fatigue in the context of wildfire events in four heavily visited southern California national forests: the Los Padres, San Bernardino, Angeles,

and Cleveland. The goal of this study was to understand the extent of message fatigue that nearby residents report relating to wildfire messaging, if at all, and if this fatigue changes residents' recreation risk perception during times of active fire or high fire risk. As climate change alters the fire regime in this region, increases in fire frequency are predicted, as the result of fall precipitation coming later in the year and warmer drier conditions during summer (Goss et al., 2020). If residents are not associating high levels of risk with fire, managers will need new strategies to keep visitors informed and recreating.

3. RESEARCH QUESTIONS

This research on message fatigue and the effect of fatigue on perceived risk, was guided by two research questions:

RQ_1: How much, if at all, are southern California residents who recreate locally in national forests experiencing message fatigue regarding wildfire and wildfire risk events?

RQ_2: How do levels of message fatigue relate to their decision-making processes and perceptions of risk?

4. METHODS

4.1 Data collection

We defined "local visitors" as Southern California adults (18 years or older) who reside in one of the ten counties proximate to one or more of the four national forests of interest (Los Padres, San Bernadino, Angeles, and Cleveland National Forests) and have visited at least one of these four forests at least once since summer 2020. The ten local counties sampled are: Kern, Los Angeles, Monterey, Orange, Riverside, San Bernadino, San Luis Obispo, Santa Barbara, San Diego, and Ventura.

To reach these local visitors, we used a zip code based Qualtrics panel sample. Qualtrics

is a web-based survey tool that allows surveys to be created, distributed, and analyzed (Duong, 2023). Survey panels allow for responses from visitors beyond those who would be intercepted in on-site sampling, and at a lower cost (Perry et al., 2015), and have been shown to be an effective method to virtually collect visitors' experiential data (Taff et al., 2021).

The survey instrument, constructed and disseminated using Qualtrics software, was available in English and Spanish to account for the diversity of languages spoken in our target area. Survey respondents who completed a quality survey were compensated via Qualtrics. The survey was left open for nearly 3 months, with a final sample of 3,585 high quality responses. An additional 327 responses were excluded because of low quality. These responses were marked for removal by the research team in addition to the responses Qualtrics culled based on their removal standards.

Data validation measures were included in the survey promoting data integrity (i.e., question(s) designed to detect spurious or automated responses) and served as reference points for identifying low quality and automated responses. Beyond basic standards for exclusion (e.g., not meeting minimum expected length of time in the survey, incomplete responses), we removed additional responses with repetitive or incongruent straight-line answers through question batteries, invalid dates of birth, invalid or non-California zip codes, and invalid open response answers (e.g., off-topic, gibberish). Although some low quality and automated responses were expected, large portions of the survey responses, especially in the Spanish version, were identified during our data cleanings and subsequently replaced by Qualtrics. This resulted in the survey being open for responses longer than expected but ultimately with a response dataset of higher quality confidence.

Data collection was timed to coincide with a period of high fire risk and active fire in

southern California, so that the respondents might find greater salience with the study topic. During the survey deployment window, 11 fires occurred in southern California. These 11 fires included neither controlled burns conducted on the forests, nor high fire risk days where forests may have been impacted by the risk of fire danger. The fires ranged in size from 5 to 5,464 acres and were burning anywhere from 1 to 11 days, according to CAL FIRE incident report archives from 2023.

Overall, the survey contained questions related to visitor use preferences, patterns, displacements, messaging and fatigue, risk, and demographics. For this article, we examine two themes within these data: message fatigue and how this affects decision processes. These were asked using quantitative, scaled questions (see Tables 4-6). Comparable questions have been used in risk research by Ferrer et al. (2016) on concern, fear, and worry. Questions measuring how often respondents interacted or received information about wildfires or wildfire risk events and the effect that amount has on perceive risk of wildfires or wildfire risk events were asked.

4.1.2 Data analysis

Data analysis was conducted using IBM SPSS statistical software version 28.0. Descriptive statistics were processed on respondent demographics, including gender and race/ethnicity. Descriptive statistics also identified information sources used or not used by respondents on the topics of site conditions, site closures, and wildfires (Table 4). Finally, they provided insight on respondents' perceptions about message frequency, content, and quality, and adherence to US Forest Service recommendations and perceptions of risk.

Once completed, a reliability analysis was performed for both message fatigue and risk related questions. This ensured responses were consistent regarding the items used to measure our latent concepts by using Cronbach's alpha reliability coefficients (Vaske, 2008). The

adequate scores here allowed us to discuss these latent concepts in interrelated terms (Vaske, 2008), as is commonly done in recreation-centered inquiries across broad populations (e.g., Perry et al., 2015). The message fatigue and risk Cronbach's alphas were above the threshold (.81 and .71, respectively). A K-means cluster analysis was next done for the message fatigue questions to create fatigue groups. Cluster analysis categorizes responses into groups maximizing similarities within and differences between clusters (Vaske, 2008). This is done by using multiple variables, so we can differentiate the clusters. Measuring distance from the center of one cluster to another, K-means clustering can determine the similarity or dissimilarity of variables (Benson et al., 2013). An ANOVA was conducted to compare the fatigue groups to the different risk concepts and the risk index overall.

5. RESULTS

Overall, 3,585 high quality responses were retained to use as our total sample size. Of these, 50.4% of respondents identified as male; 47.9% as female; and 1.7% as non-binary, prefer not to say, or other. In terms of racial diversity and ethnicity, respondents chose non-exclusive categories in the following frequencies: white (66.5%); other (11%); Black or African American (10.4%); Asian (8.4%); and American Indian or Alaskan Native, prefer not to say, and Hawaiian or Pacific Islander totaling 9.8%. One-third (32.5%) of respondents identified as having Hispanic, Latino/a, or Spanish origin.

Respondents were asked to identify the type of information sources they use or do not use to find information concerning site conditions (trail conditions, weather, etc.), site closures, and wildfires. Across all responses, visitors substantially used either US Forest Service provided information sources or their own social networks for information, while the fewest people used other organizations' websites or emails (Table 5).

When examined individually, site conditions (e.g., weather, crowding, etc.) have four clearly popular information sources (i.e., a majority of respondents indicating their use). These sources include US Forest Service social media accounts (54.5%), friends/relatives/word of mouth (52.5%), sources at the forest such as trailheads or sign boards (51.4%), and finally the US Forest Service websites (50.7%) (Table 4). Site closures have four popular sources that are being used by 40-49% of respondents. The most popular place for visitors to go for information on site closures are sources at the forest itself (49.3%). The other three most used sources are the US Forest Service website (46.8%), an interpretive center or visitor center in the forest (43.6%), or their friends / relatives / word of mouth (42.9%). For wildfire information sources, no single source stood out as more popular than the others. The most used source was the US Forest Service websites (31.2%).

Table 4. Sources used by visitors to obtain trail conditions and closures.

Info source	Site conditions (%)	Site closures (%)	Wildfires (%)	Do not use (%)
Forest Service social media accounts (e.g., Facebook, Instagram, Twitter)	54.5	38.4	25.5	32.1
Other social media accounts	38.9	32.2	19.4	42.7
Apps (e.g., *AllTrails, Strava*)	38.9	31.0	17.7	43.5
Forest Service websites	50.7	46.8	31.2	27.3
News websites	41.2	35.6	30.7	34.3
Forest Service press release	34.2	31.7	21.6	45.7
Other organizations' websites / emails	29.9	25.6	15.5	53.1
Radio / TV (e.g., news station)	37.5	32.2	26.5	41.2
At the forest - Interpretive / visitor center	47.1	43.6	25.2	32.8
At the forest - Trailhead / sign board / kiosk	51.4	49.3	25.3	26.2
Friends / relatives / word of mouth	52.5	42.9	29.3	29.4

Totals will equal over 100% as respondents could choose more than one answer

5.1 RQ1: How much, if at all, are southern California residents who recreate locally in national forests experiencing message fatigue regarding wildfire and wildfire risk events?

A scale of items was included for message quality, content, amount, and frequency regarding wildfires both in general and in national forests. Respondents felt that the quality, on a 5-point scale of these messages was average to good (M=3.71 in general, M=3.74 in national forests) and the content, on a 5-point scale, was moderately to very important or relative (M=3.44 in general, M=3.48 in national forests) to them. When questioned about the amount of messaging received regarding wildfire and the national forests specifically, respondents felt the information, on a 3-point scale, was slightly less than what they wanted to receive (M=1.90). On a 9-point scale, respondents indicated that they are interacting with this type of messaging a few times a year (M=3.58 in general, M=3.72 in national forests). The reliability analysis for these items resulted in a Cronbach's alpha of .81, indicating a sufficiently reliable measure (Table 5).

Respondents' answers concerning risk concepts (concern, fear, extent, and severity) regarding wildfires in southern California and/or when visiting the forests in the study resulted in mean response values of M=3.80 (concern), M=3.40 (severity), M=2.91 (fear), and M=2.94 (extent), on a 5-point scale. Our results show that visitors only sporadically adhered to recommendations put out by the US Forest Service regarding wildfires (M=3.15; 4-point scale). The reliability analysis resulted in a Cronbach's alpha of .71, indicating a sufficiently reliable measure (Table 5).

Table 5. Message fatigue and risk indices regarding wildfire messaging. Cronbach's alphas for Fatigue and Risk were .81 and .71, respectively.

Variable	Question	M	Item total correlation	Alpha (α) if deleted
Fatigue[1]				
Wildfire in general	[2]Thinking about the past year (since fall 2022), **how often** did you encounter messaging about **wildfires / wildfire risk happening generally**?	3.58	.58	.74
	[3]Thinking about the past year (since fall 2022) the **content** of messaging I encountered about **wildfires / wildfire risk happening generally** was…	3.44	.58	.74
	[4]Thinking about the past year (since fall 2022), the **quality** of messaging I encountered about **wildfires / wildfire risk happening generally** was…	3.71	.51	.76
Wildfire in national forests	[2]Thinking about the past year (since fall 2022), **how often** did you encounter messaging about **wildfires / wildfire risk happening in national forests**?	3.72	.59	.75
	[3]Thinking about the past year (since fall 2022), the **content** of messaging I encountered about **wildfires / wildfire risk happening in national forests** was…	3.48	.59	.74
	[4]Thinking about the past year (since fall 2022), the **quality** of messaging I encountered about **wildfires / wildfire risk happening in national forests** was…	3.74	.52	.76
Risk				
	How **concerned** are you about wildfires in southern California?	3.80	.51	.64
	How **afraid** are you of experiencing a wildfire while visiting Los Padres, Angeles, San Bernardino, or Cleveland National Forest?	2.91	.56	.60
	To what **extent** do you feel you might experience a wildfire while visiting Los Padres, Angeles, San Bernardino, or Cleveland National Forest?	2.94	.47	.66
	How **severe** do you think the consequences would be if you experienced a wildfire while visiting Los Padres, Angeles, San Bernardino, or Cleveland National Forest?	3.40	.45	.68

[1]"Amount" excluded from fatigue index as it did not meet reliability requirements. How often [2]"frequency" is on a scale of 1 to 9, [3]"content" and [4]"quality" are on a 1 to 5 scale. All risk variables are on a 1 to 5 scale.

5.1.2 RQ2: Do levels of message fatigue relate to their decision-making processes and perceptions of risk?

The K-means cluster analysis for fatigue resulted in four distinguishable groups experiencing different levels of fatigue.

- Less fatigued and high information frequency – those who want a lot of information and

are seeking it out (28%).

- Less fatigued and low information frequency – those who do not want a lot of information and are avoiding it (14%).
- Somewhat fatigued and moderate information frequency – those in the middle who are feeling fatigued but not yet completely fatigued (23%).
- Most fatigued and low information frequency – those who are feeling the most fatigue, the largest group (35%), and at capacity for information.

Finally, an ANOVA highlighted that as message fatigue increases, the level of perceived risk decreases (M=3.98 to M=2.95) with a large effect size (η=.42). For the overall concept of risk perception and each of the four dimensions asked within it, each cluster was statistically distinct from the other three clusters ($p<.001$). The inverse correlation between message fatigue and perceived risk is consistent within each of the risk questions across clusters. Table 6 highlights each cluster's means on the concept of risk and its four embedded concepts and shows that these patterns were strong, with medium to large effect sizes (η=.25 to .43). The only exception to this was with "extent," where the less fatigued and less info frequency cluster and the somewhat fatigued cluster were not statistically different from each other, but they were statistically significant from the other two clusters. Thus, this follows the same general pattern, but with a three rather than four-cluster distinction. With the four different fatigue groups each viewing risk differently, decreased as fatigue increases, message fatigue is changing the risk perception of visitors.

Table 6. Comparison of message fatigue clusters and risk concepts. All p values for the five variables were < .001., with superscripts indicating statistically similar/distinct groups at the p < .05 level.

		Mean						
Variable	Question	Less Fatigued & High Info Frequency (28%)	Less Fatigue & Less Info Frequency (14%)	Somewhat Fatigued & Moderate Info Frequency (23%)	Most Fatigued & Low Info Frequency (35%)	Overall	F-value	η effect size
Risk		3.98[a]	3.55[b]	3.31[c]	2.95[d]	**3.35**	205.44	.42
	Concern	4.53[a]	4.27[b]	3.84[c]	3.37[d]	3.89	218.29	.43
	Fear	3.52[a]	3.17[b]	3.00[c]	2.63[d]	2.99	61.56	.25
	Extent	3.99[a]	3.06[b]	3.09[b]	2.68[c]	3.07	134.72	.35
	Severity	3.86[a]	3.69[a]	3.32[b]	3.13[c]	3.43	61.64	.25

6. DISCUSSION

Understanding how visitors see the risk associated with wildfires and recreation is a necessary component for park managers keeping the public safe. With there being four different fatigue groups, standard messaging may only work on the less fatigued individuals and be ignored by the somewhat or most fatigued. This supports the suggestions made by So et al. (2017) regarding health messaging groups and creates a dangerous situation for the US Forest Service. Any new messaging strategies must consider the different levels of fatigue. Because each person has their own acceptable level of messaging before they become fatigued (Mao et al., 2022), it will be important to create varied messaging styles to break through these individualized levels of "information overload" to keep visitors safe and aware of risks while recreating. The identification of four different fatigue groups may have helped give insight to acceptable levels of messaging for four of these individualized levels.

Knowing that visitors are using either the US Forest Service information sources or their

own social networks the most for information related to forest conditions, closures, and wildfires is vital for risk communicators. As managers communicate, they can target channels that are most frequently utilized. This may signal that the US Forest Service information sources are perceived to have the most up-to-date and reliable information and/or that they are a trusted source of information. Social networks are popular information sources as they can influence the behaviors of other individuals within the network (Tunçgenç et al., 2021), which can lead to reliance on these networks for information. These social networks and the conversations shared among them can directly influence risk behavior and evaluation (Bodemer & Gaissmaier, 2015; Carper, 2019).

Still, others are relying on trailhead signs, signboards, or kiosks at the forest to learn if the area they want to visit is closed and in what condition. This seems counter-intuitive if one is looking to have a positive experience during their time in the forest and potentially results in numerous disappointed visitors. This waiting to find out information about a location until at the forest could result in visitors being disappointed in their experiences from a lack of preplanning. This avoidance can be explained as a potential byproduct of message fatigue (Kim & So, 2018; So & Popova, 2018).

Our results show that visitors are not sure where to get information regarding wildfires. With percentages ranging from 17% to 31%, there is no clearly popular information source being utilized – i.e., multiple sources are being used. Respondents may be more interested in whether the site they are visiting is open and in good condition versus whether wildfires are possible. Due to this potential lack of interest or confusion, respondents might not know where they should be getting their wildfire information. This is supported by results showing visitors are only slightly or somewhat afraid (M=2.91) about a wildfire taking place when they are out recreating and only

slightly to considerably concerned (*M*=3.80) about fires taking place in general in southern California (Table 5).

Perceived risk values decreased as we move from the lowest fatigue level to the highest (Less fatigued and high information frequency risk *M*=3.98, Most fatigued and low information frequency risk *M*=2.95; see Table 6). Similar results were found from Popovic et al. (2020) on stress, where those who were experiencing high stress levels were less concerned. It may also be possible that this fatigue is a result of a low information sufficiency threshold. That is, visitors are fatigued because they feel they already have enough wildfire information (Yang et al., 2014). This is concerning as we think about visitor safety during times of high fire risk. The less perceived wildfire risk, the more risk visitors are unknowingly putting themselves in. Although managers do seem to have some latitude to increase messaging (respondents reported feeling they are receiving just under the acceptable amount), they should target who they send the information to, as suggested by So et al. (2017).

The somewhat fatigued and moderate information frequency and most fatigued and low information frequency groups are experiencing the most fatigue, but they are also associating the least amount of risk with wildfires. This potentially puts these two groups in the most danger when visiting the forests. A targeted approach allows the easier reached groups, like the two lesser fatigued groups, to receive less messaging avoiding boredom and ignorance of messages, so as not to push them into the more fatigued groups, while concentrating on the harder to reach groups, the more fatigued groups, to receive more pointed messages to increase risk perception (So et al., 2017). The lesser fatigued groups are easier to reach in that they are less fatigued and able to intake more information regarding fire risk. So et al. (2017) suggests using both positive and negative framed messages, highlighting reasons to adopt a behavior instead of simply giving

information, and producing new radical angles to present messages to break through fatigue.

The two lesser fatigue groups are unique in that they are less fatigued, not yet at capacity, and interacting with messages at different frequencies. Future research should investigate the differences between these two groups and why one seeks out more information than the other. It is possible that those interacting more frequently could be seeking out the information because they are interested in it. This interest then reduces the fatigue levels associated with the messaging. The less information frequency group could be simply avoiding the information, as they have already made up their minds regarding wildfire risk and no amount of added information will change their opinion (Drummond & Fischhoff, 2019). Creating messages for these groups comes with a different challenge than with the other two groups, as it seems one will gladly take more information but the other will not.

7. CONCLUSION

The results of this survey show that southern California local visitors of the Los Padres, San Bernardino, Cleveland, and Angles National Forests are indeed feeling the effects of message fatigue regarding wildfire risk events. This is associated with altering their perceived risk of such events. Communication frequency highlights important distinctions in those who are least fatigued. The clusters of visitors we created for this study have a strong pattern across risk measures, illustrating that as fatigue increases the level of risk associated with fire risk decreases. With these different levels of fatigue, one single strategy most likely will not work to combat this problem.

Better and more varied (e.g., different framing, targeting specific groups) messages will have to be created to try to reduce this fatigue with the hopes of keeping recreators safe in the forests. So et al. (2017) believes optimal exposure levels to messaging (which have not yet been

determined), understanding of content-specific factors such as framing of messages being delivered, and variation in message repetition (different forms emphasizing similar meanings) play a role in reducing message fatigue. Our work here may have helped identify four populations (less fatigued and high information frequency, less fatigued and less information frequency, somewhat fatigued and moderate information frequency, and most fatigued and low information frequency) that are possible to fall into for optimal exposure level. More research could be done to further refine these groups and understand what makes them different. Each of these groups will likely require different types and frequency of messages to gain their attention as fatigue sets in. In California, varying risk communication approaches is only made more complicated in the face of climate change, which is altering fire patterns increasing their frequency. Each year, these messages will likely have to be revisited and altered to gain the attention of these different groups.

It is possible that message fatigue could be prolonged, more time lapses before becoming fatigued, by varying the types of messages individuals see on a subject. Forest managers should adopt these same practices when creating new messages for recreationalists, so visitors may stay engaged with the new information provided. Other strategies need to be created as well, to see if there are other options other than new messages that could keep visitors aware of the risks associated with wildfires and break through this fatigue. Other strategies may include interactive displays or talks at visitor / interpretive centers that would reach those who wait to receive information until they are at the forest. Future research should look at demographics for the fatigue groups to see if there are any groupings that could be found and further analyzed to help create a clearer picture of the fatigue levels and the associated risk perception. If message fatigue then leads to "risk fatigue," and risk perception levels fall to a point of causing unsafe behavior,

then communicators will have a challenging task of breaking through this fatigue to keep park visitors safe.

Chapter 4: Conclusion.

Overall, this research inquiry emphasizes and supports the importance of understanding recreationists to better serve their needs and keep them safe in our national forests. Using quantitative methods, I was able to identify this as an essential addition within the recreation conversation happening in the US Forest Service. The preceding Chapters support five main takeaways as outlined below:

(1) Across the 15 drivers of displacement, extreme heat is the most noted by Southern CA respondents as a reason to change an aspect of their visit.

(2) Support for companion displacement as a new type of displacement is found.

(3) Cultural ecosystem service motivators fall into two groups, knowledge or knowledge and place-based motivators.

(4) Respondents rely on US Forest Service information sources or their personal social circles for information relating to site closures and conditions and a mix of sources for wildfire information.

(5) Respondents fell into four message fatigue groups which were negatively correlated with risk perception.

MANAGERIAL IMPLICATIONS

These findings have been, and will continue to, inform the US Forest Service Pacific Southwest Research Station scientists as they consider how to create new messaging. In both Chapter 2 and Chapter 3, messaging plays a key role in the reduction of displacement and the reduction of risk perception. Chapter 2 specifically provides insight on the types of displacement occurring in the forests, how recreationists correspondingly changed their plans to have a quality experience, and the motivators (CES) contributing to these changes. By utilizing this analysis, the US Forest Service can approach the creation of new messages well-informed and well

equipped to offer new areas, times, or activities to keep recreationists engaged and satisfied. Focusing changes on activities and companions may be the best strategy as respondents are less willing to change the place or time of recreation. Offering options and keeping recreationists engaged is important as the US Forest Service continues to work towards their mission statement of "Caring for the land and serving the people" as the engagement and options will not only serve the people by offering recreation opportunities but also protect the land by offering opportunities in areas where it is not already degraded.

Chapter 3 outlined insight into how frequent messaging regarding wildfires is affecting the risk associated with fires during times of recreation. Times of fire are predicted to increase in regions such as southern California due to climate change. By understanding message fatigue regarding fire messages and utilizing the four fatigue groups identified, the US Forest Service will be able to focus their messaging strategies on those groups who most need it (e.g., those with the lowest risk perception). Climate change is going to affect fire patterns alter to more frequent fires (Goss et al., 2020) potentially increasing messages received. Each year, these messages are going to have to be revisited and altered to gain the attention of these different groups, the information gathered here has given managers a framework to use in the future for updates.

Although this study was focused contextually on four southern California national forests, these findings and study methods could be easily transferable to any other national forest engaged in this type of research. The connection between message fatigue and risk perception regarding wildfires is not common in the literature, with only Mackie (2014) researching the topic in Australia, but hopefully this study can be looked at as an example and be used as a source of inspiration to other research teams to engage in similar studies. The findings in this

thesis emphasize the importance of understanding messaging and the effects said messages have on their receiver.

RESEARCH AND THEORETICAL IMPLICATIONS

Ultimately this thesis explored research inquires pertaining to displacement, message fatigue, and risk in southern California national forests using quantitative methods and areas of inquiry less researched. Beyond the utilization of this data for the use of the US Forest Service Pacific Southwest Research Station, this study contributes new knowledge to the current body of research literature in two important ways. First, my results expanded on the existing displacement framework by finding support for companion displacement as an additional type of displacement (Chapter 2). Looking at cultural ecosystem services through the lens of motivators for recreation has allowed us to consider drivers of displacement in a new way that encompasses not just the physical benefits but the cultural ones as well.

Second, my research expanded on research involving wildfires and message fatigue by contributing to the sparse literature that connects the concept of message fatigue in a wildfire setting (Chapter 3). By defining four fatigue groups, my research has moved the literature closure to understanding the optimal exposure level that So et al., (2017) believes is key to avoiding fatigue and keeping individuals informed.

At a nexus of recreation, natural resource management, and risk communication, this research illuminate's areas of concern and places for further research. Although in the contextual setting of southern California national forest, this approach could be easily used in other national forest settings and select discussion points could be used in future research efforts, specifically those emphasizing companion displacement and message fatigue and fire risk perception. An outcome of academic-institutional partnership, this research acts as a standalone study while also being informative to US Forest Service management and outreach.

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SoCal Fires English

Start of Block: study purpose and consent

You are being asked to participate in a research study. The purpose of collecting this data is to obtain information about users of the Los Padres, Angeles, San Bernardino, and Cleveland National Forests in Southern California. This survey focuses on topics related to your use of these forests and the messages you may have seen in these areas. Your participation in this study will take about 15 minutes. Your participation is voluntary. Your response is anonymous. You must be 18 or older to participate. If you have any questions, please contact Dr. Elizabeth Perry, at eeperry@msu.edu or 541-224-7639. By submitting this survey, you indicate that you voluntarily agree to participate in this research study.

○ I agree. Continue. (1)

Page Break

Visitor definition: Anyone who comes to one of the following four forests since summer of 2020: Los Padres, Angeles, San Bernardino, and/or Cleveland National Forest (see map for general locations).

A visitor may be interested in simply enjoying the peace and quiet of the forest, going for a scenic drive and stopping at points of interest, or engaging in a more active form of outdoor recreation (e.g., picnicking, hiking, camping, fishing, birdwatching).

Which, if any, of the four forests - Los Padres, Angeles, San Bernardino, Cleveland – have you visited since summer of 2020? (select a forest / multiple forests by clicking on its name on the map OR "none of these four forests" on the map)

	Off (1)	On (2)
Los Padres (1)		
Angeles (2)		
San Bernardino (3)		
Cleveland (4)		
None of the forests (5)		

Skip To: End of Block If Which, if any, of the four forests - Los Padres, Angeles, San Bernardino, Cleveland – have you vi... = None of the forests [On]

End of Block: study purpose and consent

Start of Block: General visitation

Display This Question:

If Which, if any, of the four forests - Los Padres, Angeles, San Bernardino, Cleveland – have you vi... [On] (Count) >= 2

Carry Forward Selected Choices from "Which, if any, of the four forests - Los Padres, Angeles, San Bernardino, Cleveland – have you visited since summer of 2020? (select a forest / multiple forests by clicking on its name on the map OR "none of these four forests" on the map)"

Which one of these forests do you visit the most?

- ○ Los Padres (1)
- ○ Angeles (2)
- ○ San Bernardino (3)
- ○ Cleveland (4)
- ○ None of the forests (5)

The following set of questions asks about your experiences with the forest you visit the most. Thinking only about this forest, please answer the following.

How far do you travel to visit this forest?

- ○ 0 - 25 miles (1)
- ○ 26 - 50 miles (2)
- ○ 51 - 75 miles (3)
- ○ 76+ miles (4)

Generally, how long does this travel take?

- ○ Under 30 minutes (1)
- ○ 30 - 60 minutes / 1 hour (2)
- ○ 1 - 2 hours (3)
- ○ 2+ hours (4)

How frequently do you visit this forest?

- ○ Less than once a year (1)
- ○ Once a year (2)
- ○ A few times a year (3)
- ○ Once a month (4)
- ○ A few times a month (5)
- ○ Once a week (6)
- ○ More than once a week (7)

Generally, how long do you spend visiting this forest once you arrive there?

	0 2 4 6 8 10 12 14 16 18 20 22 24
Hours (if less than one day) ()	
Days (if 24 hours or more) ()	

What activity(ies) have you engaged in at this forest? (select all that apply)

- [ ] Hiking / Walking (1)
- [ ] Biking (2)
- [ ] Running (3)
- [ ] Camping (campgrounds, OHV's, etc.) (4)
- [ ] Backpacking (5)
- [ ] Skiing / Snowboarding (6)
- [ ] Horseback riding (7)
- [ ] Gathering forest products (mushrooms, fiddleheads, etc.) (8)
- [ ] Hunting (9)
- [ ] Fishing (10)
- [ ] Engaging in water activities with a watercraft (kayaking, boating, etc.) (11)
- [ ] Engaging in water activities without a watercraft (swimming, hot springing, etc.) (12)
- [ ] Engaging in motorized activities (OHV's, snowmobiling, etc.) (13)
- [ ] Picnicking (14)
- [ ] Enjoying nature / sightseeing (15)
- [ ] Going for a scenic drive (16)

- [ ] Going to an interpretive / visitor center (nature center, observatory, etc.) (17)
- [ ] Attending a guided experience (18)
- [ ] Gatherings with friends / family (19)
- [ ] Taking photographs / videos (20)
- [ ] Creating content for social media (21)
- [ ] Other (22) _____

Display This Question:

If If What activity(ies) have you engaged in at this forest? (select all that apply) q://QID21/SelectedChoicesCount Is Greater Than 1

Carry Forward Selected Choices from "What activity(ies) have you engaged in at this forest? (select all that apply)"

What activity have you participated in the most at this forest?

- ○ Hiking / Walking (1)
- ○ Biking (2)
- ○ Running (3)
- ○ Camping (campgrounds, OHV's, etc.) (4)
- ○ Backpacking (5)
- ○ Skiing / Snowboarding (6)
- ○ Horseback riding (7)
- ○ Gathering forest products (mushrooms, fiddleheads, etc.) (8)
- ○ Hunting (9)
- ○ Fishing (10)
- ○ Engaging in water activities with a watercraft (kayaking, boating, etc.) (11)
- ○ Engaging in water activities without a watercraft (swimming, hot springing, etc.) (12)
- ○ Engaging in motorized activities (OHV's, snowmobiling, etc.) (13)
- ○ Picnicking (14)
- ○ Enjoying nature / sightseeing (15)
- ○ Going for a scenic drive (16)

- ○ Going to an interpretive / visitor center (nature center, observatory, etc.) (17)
- ○ Attending a guided experience (18)
- ○ Gatherings with friends / family (19)
- ○ Taking photographs / videos (20)
- ○ Creating content for social media (21)
- ○ Other (22) _____

End of Block: General visitation

Start of Block: Drivers of site selection

We are interested in why you choose to visit this forest. This section asks questions on what motivates you to visit this forest.

Why do you prefer to visit this forest? (select all that apply)

- [ ] It's nearby (1)
- [ ] It's easy to get to (2)
- [ ] It's familiar to me (3)
- [ ] It holds special memories for me (4)
- [ ] Social media about this forest makes it appealing to me (5)
- [ ] It has the environment in which I want to recreate (trails, water bodies, scenic areas, etc.) (6)
- [ ] It has the weather conditions in which I want to recreate (7)
- [ ] It offers solitude (8)
- [ ] Its trails are well marked / maintained (9)
- [ ] It's free from litter (10)
- [ ] It has an acceptable number of people recreating there (11)
- [ ] It has an acceptable variety of uses there (12)
- [ ] It attracts people with similar skill levels as myself (13)
- [ ] It's a safe place for me to visit (e.g., I don't expect harassment or conflict there) (14)

☐ It's a welcoming place for me to visit (e.g., I feel I belong there) (15)

Carry Forward Selected Choices from "Why do you prefer to visit this forest? (select all that apply)"

Based on what you chose above, what are your top 3 reasons you prefer to visit this forest?

Most to least important

_____ It's nearby (x1)

_____ It's easy to get to (x2)

_____ It's familiar to me (x3)

_____ It holds special memories for me (x4)

_____ Social media about this forest makes it appealing to me (x5)

_____ It has the environment in which I want to recreate (trails, water bodies, scenic areas, etc.) (x6)

_____ It has the weather conditions in which I want to recreate (x7)

_____ It offers solitude (x8)

_____ Its trails are well marked / maintained (x9)

_____ It's free from litter (x10)

_____ It has an acceptable number of people recreating there (x11)

_____ It has an acceptable variety of uses there (x12)

_____ It attracts people with similar skill levels as myself (x13)

_____ It's a safe place for me to visit (e.g., I don't expect harassment or conflict there) (x14)

_____ It's a welcoming place for me to visit (e.g., I feel I belong there) (x15)

People enjoy forests in different ways. To what extent, if at all, do the following aspects contribute to your enjoyment of this forest?

	Not at all (1)	A little (2)	Moderately (3)	A lot (4)	Extremely (5)
Appreciate beauty (1)	○	○	○	○	○
Be inspired to create art (2)	○	○	○	○	○
Have a sense of its conservation value for future generations (3)	○	○	○	○	○
Reflect on different ways of living / different cultural practices (4)	○	○	○	○	○
Connect to traditional places / ways of life (5)	○	○	○	○	○
Learn about this setting and / or its environmental processes (6)	○	○	○	○	○
Be satisfied knowing that this setting is protected (7)	○	○	○	○	○
Gain greater understanding of myself in relation to this setting (8)	○	○	○	○	○

Experience different ways of knowing, such as traditional knowledge systems (9)	○	○	○	○	○
Spend leisure time outdoors (10)	○	○	○	○	○
Feel a deep sense of connection to this setting / the geography it represents (11)	○	○	○	○	○
Form social relationships as a result of this setting (12)	○	○	○	○	○
Connect to forces / spirituality larger than myself (13)	○	○	○	○	○
Receive physical / mental health benefits (14)	○	○	○	○	○

End of Block: Drivers of site selection

Start of Block: Types of displacement

Sometimes we are unable to recreate in the ways we would like because of site conditions. We are interested in if you have experienced this and how your plans may have changed.

First, we would like to know about your experiences in **any of the four national forests in southern California** - Los Padres, Angeles, San Bernardino, and Cleveland National Forests.

Which of the following site conditions, if any, have you experienced in **any of these four national forests**? Have you subsequently changed your recreation plans?

	Did not experience (1)	Experienced but did not affect my plans (2)	Experienced and affected my plans (3)
Extreme heat (1)	○	○	○
Fire risk (2)	○	○	○
Active fire (3)	○	○	○
Poor air quality (4)	○	○	○
Extreme rain / precipitation (5)	○	○	○
Drought / low water level (6)	○	○	○
Wind events (7)	○	○	○
Lack of parking / limited available parking (8)	○	○	○
Crowding - along the trail (9)	○	○	○
Crowding - at attractions (e.g., waterfalls, picnic areas, vistas) (10)	○	○	○
Conflict with others' activities (e.g., hiking and mountain biking on the same trail) (11)	○	○	○

Conflict with others (discrimination, harassment, etc.) (12)	○	○	○
Trash, litter, graffiti, etc. (13)	○	○	○
Site closures (14)	○	○	○
Road closures (15)	○	○	○

In general, if you are unable to visit where you would like, how far would you drive for an acceptable alternative?

- ○ 0 - 25 miles (1)
- ○ 26 - 50 miles (2)
- ○ 51 - 75 miles (3)
- ○ 76 - 100 miles (4)
- ○ 101 - 200 miles (5)
- ○ 201 - 300 miles (6)
- ○ 301+ miles (7)

Now, we would like to know more about the site condition(s) you experienced most recently in any of these four national forests and how your plans may have changed. Again, the forests are Los Padres, Angeles, San Bernardino, and Cleveland National Forests.

Display This Question:

If Which of the following site conditions, if any, have you experienced in any of these four nationa... = Experienced and affected my plans

Carry Forward Selected Choices from "Which of the following site conditions, if any, have you experienced in any of these four national forests? Have you subsequently changed your recreation plans?"

Which of the following site conditions did you experience most recently, that affected your plans to visit the forest? (select all that apply)

- ☐ Extreme heat (1)
- ☐ Fire risk (2)
- ☐ Active fire (3)
- ☐ Poor air quality (4)
- ☐ Extreme rain / precipitation (5)
- ☐ Drought / low water level (6)
- ☐ Wind events (7)
- ☐ Lack of parking / limited available parking (8)
- ☐ Crowding - along the trail (9)
- ☐ Crowding - at attractions (e.g., waterfalls, picnic areas, vistas) (10)
- ☐ Conflict with others' activities (e.g., hiking and mountain biking on the same trail) (11)
- ☐ Conflict with others (discrimination, harassment, etc.) (12)
- ☐ Trash, litter, graffiti, etc. (13)

☐ Site closures (14)

☐ Road closures (15)

Display This Question:

If Which of the following site conditions, if any, have you experienced in any of these four nationa... = Experienced and affected my plans

Thinking about this most recent experience, when did you find out about these site conditions?

○ While making my plans (1)

○ While traveling to the site (2)

○ After arriving at the site (3)

Display This Question:

If Which of the following site conditions, if any, have you experienced in any of these four nationa... = Experienced and affected my plans

In what ways did you change your plans? (select all that apply)

- ☐ Changed the location I visited (1)
- ☐ Changed the time / amount of time I visited (2)
- ☐ Changed the recreation activity I participated in (3)
- ☐ Changed the group I was with or whether or not I was solo (4)
- ☐ Chose an entirely different experience (5)
- ☐ Canceled all my plans (6)

Display This Question:

If In what ways did you change your plans? (select all that apply) = Changed the location I visited

How did you change the location you visited? (select all that apply)

- ☐ Went to a different site in the same forest (1)
- ☐ Went to a different national forest (2)
- ☐ Went to a different outdoor recreation location (e.g., a state park, a city park) (3)

Display This Question:

If In what ways did you change your plans? (select all that apply) = Changed the time / amount of time I visited

How did you change the time you visited? (select all that apply)

- ☐ Went at a different time of day (1)
- ☐ Went on a different day of the week (2)
- ☐ Went during a different month (3)
- ☐ Went during a different season / time of year (4)
- ☐ Changed the amount of time I was there for (5)

Display This Question:

If In what ways did you change your plans? (select all that apply) = Changed the recreation activity I participated in

How did you change the activity that you participated in? (select all that apply)

- ☐ Changed from a land-based to a water-based activity (1)
- ☐ Changed from one land-based to a different land-based activity (2)
- ☐ Changed from a water-based to a land-based activity (3)
- ☐ Changed from one water-based to a different water-based activity (4)
- ☐ Changed the level of challenge of the activity (5)

Display This Question:

If In what ways did you change your plans? (select all that apply) = Changed the group I was with or whether or not I was solo

How did you change the group you were with or whether you visited alone? (select all that apply)

- ☐ Decided to recreate alone (1)
- ☐ Decided to recreate with others (2)
- ☐ Recreated with a smaller group (fewer people) (3)
- ☐ Recreated with a larger group (more people) (4)
- ☐ Recreated with a group with more experience (5)
- ☐ Recreated with fewer children in the group (6)
- ☐ Recreated with fewer people with health conditions or limited ability (7)

Which forest did you **most recently visit** - Los Padres, Angeles, San Bernardino, or Cleveland National Forest? Please **type out** your selection below.

_____

How far in advance, if at all, did you begin planning for this visit?

	0 2 4 6 8 10 12 14 16 18 20 22 24
Hours (if less than one day in advance) ()	
Days (if 1-6 days in advance) ()	
Weeks (if 1-3 weeks in advance) ()	
Months (if 1 or more months in advance) ()	

End of Block: Types of displacement

Start of Block: Messaging and fatigue

Forest managers convey important forest information in multiple ways. We would like to know which sets of information you might have seen and your perspectives about this information.

For this section, please note that some questions for a topic are about messaging *in general* and others are about messaging *specifically for national forests.*

Where do you currently get information about **national forest site conditions**, especially site closures and wildfire in the forest? (multiple selections per row)

	Do not use (1)	Site conditions (e.g., weather, crowding) (2)	Site closures (3)	Wildfires (4)
US Forest Service social media accounts (e.g., Facebook, Instagram, Twitter) (1)	☐	☐	☐	☐
Other social media accounts (2)	☐	☐	☐	☐
Apps (e.g., AllTrails, Strava) (3)	☐	☐	☐	☐
Forest Service websites (4)	☐	☐	☐	☐
News websites (5)	☐	☐	☐	☐
Forest Service press releases (6)	☐	☐	☐	☐
Other organizations' websites / emails (7)	☐	☐	☐	☐

Radio / TV (e.g., news stations) (8)	☐	☐	☐	☐
At the forest - Interpretive / visitor center (9)	☐	☐	☐	☐
At the forest - Trailhead / sign board / kiosk (10)	☐	☐	☐	☐
Friends / relatives / word of mouth (11)	☐	☐	☐	☐
Other (please specify) (12)	☐	☐	☐	☐

How would you like to receive information / messages on **national forest** site closures, site conditions, and wildfires? (select all that apply)

- [ ] US Forest Service social media (1)
- [ ] Other social media pages about the region / area (2)
- [ ] Other social media pages that are fire-oriented (3)
- [ ] Apps such as AllTrails or Strava (4)
- [ ] US Forest Service websites (5)
- [ ] US Forest Service press release (6)
- [ ] News websites (7)
- [ ] Other organizations' websites / emails (8)
- [ ] Radio / TV (e.g., news station) (9)
- [ ] At the forest - Interpretive / visitor center (10)
- [ ] At the forest - Trailhead / sign board / kiosk (11)
- [ ] Highway / road signs (12)
- [ ] Local businesses (hotels, restaurants, etc.) (13)
- [ ] Friends / relatives / word of mouth (14)
- [ ] Texts (15)

☐ Other (Please specify) (16)

_____

Forest managers often post important messages at trailheads and parking lots. How often do you read any of the messages posted at the trailhead / sign board / kiosk?

○ Never (1)

○ Rarely (2)

○ Sometimes (3)

○ Often (4)

○ Always (5)

Thinking about the past year (since fall 2022), **how often** did you encounter messaging about **wildfires / wildfire risk happening generally**?

- ○ Never (1)
- ○ Once (2)
- ○ A few times (3)
- ○ About once a month (4)
- ○ A few times a month (5)
- ○ About once a week (6)
- ○ A few times a week (7)
- ○ Almost daily (8)
- ○ A few times a day (9)

Display This Question:

If Thinking about the past year (since fall 2022), how often did you encounter messaging about wildf... != Never

Thinking about the past year (since fall 2022) the **content** of messaging I encountered about **wildfires / wildfire risk happening generally** was…

- ○ Not important / relevant to me (1)
- ○ Somewhat important / relevant to me (2)
- ○ Moderately important / relevant to me (3)
- ○ Very important / relevant to me (4)
- ○ Extremely important / relevant to me (5)

Display This Question:

If Thinking about the past year (since fall 2022), how often did you encounter messaging about wildf... != Never

Thinking about the past year (since fall 2022), the **quality** of messaging I encountered about **wildfires / wildfire risk happening generally** was…

- ○ Very poor (1)
- ○ Poor (2)
- ○ Average (3)
- ○ Good (4)
- ○ Very good (5)

Thinking about the past year (since fall 2022), **how often** did you encounter messaging about **wildfires / wildfire risk happening in national forests**?

- ○ Never (1)
- ○ Once (2)
- ○ A few times (3)
- ○ About once a month (4)
- ○ A few times a month (5)
- ○ About once a week (6)
- ○ A few times a week (7)
- ○ Almost daily (8)
- ○ A few times a day (9)

Display This Question:

If Thinking about the past year (since fall 2022), how often did you encounter messaging about wildf... != Never

Thinking about the past year (since fall 2022), the **content** of messaging I encountered about **wildfires / wildfire risk happening in national forests** was…

- ○ Not important / relevant to me (1)
- ○ Somewhat important / relevant to me (2)
- ○ Moderately important / relevant to me (3)
- ○ Very important / relevant to me (4)
- ○ Extremely important / relevant to me (5)

Display This Question:

If Thinking about the past year (since fall 2022), how often did you encounter messaging about wildf... != Never

Thinking about the past year (since fall 2022), the **quality** of messaging I encountered about **wildfires / wildfire risk happening in national forests** was…

- ○ Very poor (1)
- ○ Poor (2)
- ○ Average (3)
- ○ Good (4)
- ○ Very good (5)

Overall, the **quantity** of messaging I receive regarding **wildfires / wildfire risk happening in national forests** is…

- ○ Too little - I would like more (1)
- ○ Just right - It's an adequate amount (2)
- ○ Too much - I would like less (3)

When I receive information about **wildfires / wildfire risk in national forests**, I follow the recommendations…

- ○ Never (1)
- ○ Sometimes (2)
- ○ Sporadically (3)
- ○ Always (4)

Which of the following statements, if any, do you agree with about messages regarding wildfires **in the national forests**? (select all that apply)

- ☐ Messages are in my preferred language (1)
- ☐ Messages convey key information about wildfires (2)
- ☐ Messages convey key details about air quality (3)
- ☐ Messages convey key details about risks (4)
- ☐ Messages convey key details site / road closures (5)
- ☐ Messages are easy to understand (6)
- ☐ Messages are vague / lacking specifics (7)
- ☐ Messages suggest alternatives for my recreation and visits to the forest (8)

End of Block: Messaging and fatigue

Start of Block: Risk

How **concerned** are you about wildfires in southern California?

- ○ Not at all concerned (1)
- ○ Slightly concerned (2)
- ○ Somewhat concerned (3)
- ○ Considerably concerned (4)
- ○ Extremely concerned (5)

How **afraid** are you of experiencing a wildfire while visiting Los Padres, Angeles, San Bernardino, or Cleveland National Forest?

- ○ Not at all afraid (1)
- ○ Slightly afraid (2)
- ○ Somewhat afraid (3)
- ○ Considerably afraid (4)
- ○ Extremely afraid (5)

To what **extent** do you feel you might experience a wildfire while visiting Los Padres, Angeles, San Bernardino, or Cleveland National Forest?

- ○ Very unlikely (1)
- ○ Somewhat unlikely (2)
- ○ Neither likely nor unlikely (3)
- ○ Somewhat likely (4)
- ○ Very likely (5)

How **severe** do you think the consequences would be if you experienced a wildfire while visiting Los Padres, Angeles, San Bernardino, or Cleveland National Forest?

- ○ Not at all severe (1)
- ○ Somewhat severe (2)
- ○ Neither severe nor not severe (3)
- ○ Severe (4)
- ○ Very severe (5)

End of Block: Risk

Start of Block: Demographics

Finally, we would like to know a bit about you.

What is the 5-digit zip code of the primary location where you stay the night (e.g., your home residence)?

_____

What year were you born? (enter the 4-digit year - YYYY)

_____

Which of the following describes your race? (select all that apply)

- ☐ American Indian or Alaskan Native (1)
- ☐ Asian (2)
- ☐ Black or African American (3)
- ☐ Hawaiian or Pacific Islander (4)
- ☐ White (5)
- ☐ Other (6) _____
- ☐ Prefer not to say (7)

Do you consider yourself to be of Hispanic, Latino/a, or Spanish origin?

- ○ Yes (1)
- ○ No (2)
- ○ Prefer not to say (3)

Which of the following describes your gender?

- ○ Female (1)
- ○ Male (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)
- ○ Other (5) _____

Thinking about the most recent history of your family in the United States, which statement best describes your family?

- ○ My generation (myself/siblings) is the first in my family to live in the United States (1)
- ○ My parents were the first in my family to live in the United States (2)
- ○ My grandparents were the first in my family to live in the United States (3)
- ○ My family has lived in the United States for at least four generations (4)
- ○ Other / I don't know (5)

Do you live in a multigenerational household? This is a household where **two or more adult generations (18 years or older)** live together, such as parents and their adult children or grandparents, their adult children, and their young grandchildren.

- ○ Yes (1)
- ○ No (2)
- ○ Prefer not to say (3)

What is the primary language spoken in your household?

- ○ English (1)
- ○ Spanish (2)
- ○ Chinese (Mandarin or Cantonese) (3)
- ○ Other (4) _____

End of Block: Demographics

APPENDIX II: INTERNAL REVIEW BOARD (IRB) APPROVAL LETTER

MICHIGAN STATE
UNIVERSITY

EXEMPT DETERMINATION
Revised Common Rule

July 25, 2023

To: Elizabeth Eleanor Perry

Re: **MSU Study ID:** STUDY00007918
Principal Investigator: Elizabeth Eleanor Perry
Category: Exempt 2(i)
Exempt Determination Date: 7/25/2023
Limited IRB Review: Not Required.

Title: Understanding the Drivers and Effects of Recreation Displacement in Southern California National Forests

Grant Title: Understanding the drivers and effects of recreation displacement in Southern California national forests
Sponsor: Kansas State University
Prime Sponsor: USDA Forest Service
Status: Funded

This study has been determined to be exempt under 45 CFR 46.104(d) 2(i).

Principal Investigator (PI) Responsibilities: The PI assumes the responsibilities for the protection of human subjects in this study as outlined in Human Research Protection Program (HRPP) Manual Section 8-1, Exemptions.

Continuing Review: Exempt studies do not need to be renewed.

Modifications: In general, investigators are not required to submit changes to the Michigan State University (MSU) Institutional Review Board (IRB) once a research study is designated as exempt as long as those changes do not affect the exempt category or criteria for exempt determination (changing from exempt status to expedited or full review, changing exempt category) or that may substantially change the focus of the research study such as a change in hypothesis or study design. See HRPP Manual Section 8-1, Exemptions, for examples. If the study is modified to add additional sites for the research, please note that you may not begin the research at those sites until you receive the appropriate approvals/permissions from the sites.

Please contact the HRPP office if you have any questions about whether a change must be submitted for IRB review and approval.

New Funding: If new external funding is obtained for an active study that had been determined exempt, a new initial IRB submission will be required, with limited

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