

Impact of Wildfire on Tourism in the Sierra Nevada Region
**Synthesis of Research Findings and
Recommendations**



Prepared for the Sierra Nevada Conservancy by

Jackson Wilson, Ph.D.
Associate Professor
Department of Recreation, Parks, Tourism & Holistic Health
San Francisco State University

Patrick Tierney, Ph.D.
Professor
Department of Recreation, Parks, Tourism & Holistic Health
San Francisco State University

Carl Ribaldo
President and Chief Strategist
SMG Consulting
South Lake Tahoe CA

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Executive Summary

The Sierra Nevada mountains are a magnet for visitors from around the globe. Three of the top ten tourist destinations in California, Yosemite National Park, Lake Tahoe and Sequoia & Kings Canyon National Park are found in the Sierra Nevada. For over 1.1 million international visitors to California, Yosemite is considered the state's most important, must-see attraction, frequently exceeding Disneyland in popularity. Sierra's ski resorts host global visitors and three Sierra resorts, Mammoth, Heavenly and North Star, ranked by skier volume, are consistently among the top ten winter resorts in the USA. The nine national forests in the Sierra Nevada region hosted over 22.8 million visits in 2017, and 52% of these were made by residents of California residing outside the region, who consider these forests their "mountain playground." All travelers to the Sierra Nevada region in 2019 generated \$3.6 billion in taxable sales and supported 36,400 tourism jobs in the area. The vast majority of Sierra Nevada tourist visitation is heavily dependent on vibrant mountain communities and natural resources, including healthy forests and scenic vistas. The findings of this report show that Sierra Nevada resources and tourism have been impacted by wildfire in the short and long terms, in some cases, significantly.

This current report builds on the previous four stages of research that investigated the issue of wildfires and tourism in the Sierra Nevada region. This research included an extensive literature review, survey of California residents and nonresidents, ten interview reports and case studies, and an economic impact analysis.

The primary goals of this report are to provide a very brief review of key study findings, and most importantly, to synthesize the recommendations from the previous stages of research. Below is a list of the categories of recommendations.

- Communication & Education
 - Pre-fire
 - Develop nested communication networks
 - DMOs meet with fire-fighting agencies to embed tourism rep on future fire Incident Command Teams
 - Establish how messaging will be communicated to all parties
 - Update emergency plans, especially for small businesses
 - Develop and sponsor fire mitigation and emergency preparedness workshops for tourism dependent businesses and local agencies
 - Influence and communicate about intentional power outages
 - Encourage acquisition of preparedness equipment
 - Encourage smart development and maintenance
 - Communicate preparedness and prepare to communicate impact
 - Prepare an economic impact study
 - During the fire
 - Goals: consistent, accurate, current, and clear information
 - Challenged by parties getting their information from different sources
 - Provide tourism organizations information to modify operations if needed and inform customers
 - Content
 - Primary: safety and minimization of property destruction
 - Secondary
 - Differentiating between prescribed fire smoke and wildfire smoke to avoid unnecessarily reducing tourism
 - Alternative tourism and recreation opportunities in the Sierra Nevada region and road access to them
 - Inform decision to fully suppress or manage a fire

- Mixed evidence of potential tourists' sensitivity to wildfire
 - Process
 - Embed individuals in ICT to increase consideration of impact of recreation and tourism when choosing management decisions and messaging
 - Provide feedback mechanism to the ICT
 - Communicate consistently to all parties with special consideration for hard to contact tourists
 - Collect data for economic impact study
 - Post-fire
 - Goals: Recovery of destination image and informing locals of economic recovery opportunities
 - Content: Marketing to facilitate image recovery and information about recovery resources
 - Process: Inclusive of multiple perspectives from a broad coalition of agencies, destination marketing organizations, and local businesses
 - Finalize and communicate economic impact study
- Technology
 - Enhance technology to collect and distribute tourism related fire information
- Forest health
 - Inform constituents and policy makers of health forests–healthy tourism connections
 - Work with federal, state and local public agencies and nonprofits to support forest health improvement projects
 - Seek funding from nontraditional sources who recognize and support California's Climate Action Plan and receive tourism benefits from healthy forests
- Developing Financial Support
 - Encourage more firefighting and recovery contracts staying local
 - Insurance
 - Grant Application and Administration
 - Pre-fire: preparedness and training grants
 - Pre-fire: forest health initiatives in and around tourism destinations
 - Post-fire: recovery funding
 - Encourage more firefighting and recovery contracts staying local
 - Insurance
 - Work with state agencies and insurance companies to limit increases in fire insurance cost increases and increase availability.
 - Provide input on forthcoming workers comp. regulations regarding tourism staff working outdoors during fire season
- Influence rules about working in smoky conditions
- Future Research

Research has shown the majority of Sierra tourism is dependent on outdoor recreation and natural resources, which require healthy forests, streams and scenic vistas. Healthy forests encourage and support optimal tourism experiences and economically vigorous communities who depend on visitors. Vibrant local communities are vital to tourism because they provide most of the services desired by visitors. But the lure of the region for tourists, the vitality of tourist-serving communities and forest resources are increasingly threatened by wildfire. Studies have shown deferred forest maintenance can degrade the tourism experience and increase the incidence of larger more damaging fires. Yet most (82%) of this study's survey respondents supported augmented funding for forest management practices to reduce wildfire risk and mitigate impacts.

The increases in wildfire seen in the last five years leads to the question, “How much longer will tourism in the Sierra remain viable?” Furthermore, “What will be the cumulative effects of an increasing number of wildfires to the region and state?” One author went so far as to say wildfires in the state pose an “existential” threat to California tourism (Poiriroo, 2019). Similarly, Governor Newsom commented about wildfire, “The unprecedented scale of the (wildfire) crisis requires an unprecedented response” (Office of the Governor, 2020).

This report documents the impacts of wildfire on Sierra Nevada tourism; the visitors, tourist-serving businesses, its communities, and governments. Building upon focus groups, surveys of national and state residents, and an economic impact analysis; this study details the scope and characteristics of impacts on tourism and presents recommendations to help the region minimize adverse impacts from wildfire. Recommendations are presented on pre-, during and post-fire strategies for communications, education and training, enhancing technology, forest health, developing financial support, influencing the rules regarding working in smoky environments and future research.

Our research suggests now is the time for the Sierra Nevada Conservancy, state and federal government agencies, regional organizations, local communities, tourist-serving businesses, and residents to act to minimize and mitigate future wildfire direct and indirect impacts on tourism by minimizing additional forest management practices, including restoring forests, streams, and natural resources to healthy conditions. These changes will support robust levels of regional tourism and thriving local communities by reducing the incidence of large wildfires which interrupt, damage or close tourism attractions and service providers. Otherwise, travelers and their many economic benefits may go elsewhere.

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Introduction

The Sierra Nevada region (Figure 1) is a year-around magnet for tourists from around the world and is particularly important to California tourism. Without the opportunity to visit iconic locations, such as Yosemite and Lake Tahoe, our study results indicate these visitors may choose to go elsewhere. The primary areas of recent economic growth in the counties of the Sierra Nevada has been from the recreation and tourism industries (Sierra Forest Legacy, 2020). Our study findings indicate this reliance on tourism requires access to natural resources, particularly healthy forests, streams, and scenic vistas and economically thriving local communities.



Figure 1. Sierra Nevada Region and Study Area

Context

The Sierra Nevada region draws visitors from around the world and is particularly important to California tourism. The region is also considered the “mountain playground” for many residents of California. The following data illustrate key statistics and relationships for Sierra Nevada tourist visitation.

- Three of the top ten tourist attractions in the state are found in the Sierras; Yosemite National Park, Lake Tahoe and Kings Canyon/Sequoia National Park (Burrell, 2017; Law, 2020).
- The Sierras are a strong draw from nonresident visitors to the state. Economically, this is key because nonresident tourists on average stay longer and spend more on a trip than do locals, who more often take day trips (Robie, 2019).
- Yosemite is considered the state’s most important must-see attraction for international visitors, exceeding Disneyland, San Francisco’s Golden Gate Bridge, or the San Diego Zoo in popularity (Attractions of America, 2020).

- Of the 4.4 million visitors to Yosemite National Park in 2019, about 25%, or 1.1 million, reside outside the USA (National Park Service 2020b and 2009). This provides a minimum estimate of how many international visitors come to the region during spring, summer and fall.
- During the winter, the Sierra Nevada's ski resorts host visitors from around the globe and three Sierra resorts: Mammoth, Heavenly and North Star; ranked by skier volume, are consistently among the top ten winter resorts in the USA (Traynor, 2020).
- During the 2010-11 season, skier visits to resorts located in the Sierra Nevada totaled 6.6 million, or 83% of all skier visits in California (Tierney 2012).
- There were over 22.8 million visits made in 2017 to the nine national forests found in the Sierra Nevadas (National Forest Service, 2017). In the Eldorado National Forest, 52%, or 11.8 million visits, were made by California residents who resided outside the region, 28% were made by regional residents, 2.5% by non-California residents from the USA and 1% were international visitors.
- In California during 2019, tourism generated \$144.9 billion in travel spending, \$12.2 billion in state and local taxes, and created over 1.2 million jobs. During this same time, tourism in the Sierra Nevada region generated \$3.6 billion in travel spending and 36,400 jobs. (Dean Runyan Associates Inc., 2020).
- Tourism makes up a larger portion of economic activity in the 22 California counties that are part of the Sierra Nevada region compared to California as a whole. The average percentage of visitor-generated taxable sales for the 22 counties in 2018 (14.7%) was more than twice as high as overall for the state (7.0%; Dean Runyan Associates Inc., 2020). Tourism is the economic life blood of the region, especially in smaller rural counties and communities in this region.

Unfortunately, the frequency and severity of wildfires is having a large impact on the forested landscapes of this mountainous region. From 1972 to 2018 there was a five-fold increase in the number of acres burned annually in California (Williams et al., 2019). This increase in fires is at least partially attributable to a combination of (a lack of) forest management and a change in climate that includes longer periods of aridity¹ and heat that reduces forest moisture, especially in the north coast and Sierra Nevada regions of California (Goss et al., 2020; Williams et al., 2019). The effects of climate change are further complicated by a federal administration that blames state politicians for failing to properly manage the forests and threatens to cut federal funding for firefighting and recovery, despite the majority of California forests being managed by federal agencies (Wright, 2019).

Wildfires can lead to wholesale closures of natural areas and access to them in the short-term.

"In the case of the Ferguson fire, Yosemite National Park was closed for 22 days. This was a huge impact". Mariposa Focus Group & Interviews

"After a large fire, degradation of the scenery and infrastructure needed to attract and sustain tourism in the longer-term can occur" (Kent et al., 2003).

"The long-term impact is from burnt trees degrading the scenic quality of an area." Angels Camp Focus Group & Interviews

¹ As of February 2020, it is the driest recorded winter in the Sierra Nevada mountains (Alexander, April 1, 2020).

Although the flames may more intensively impact an area, smoke has a more extensive impact.

“The biggest problem with wildfire is smoke in the area keeping people away.” Angels Camp Focus Group & Interviews

The presence of smoke can be oppressive, but it may often disappear with a change in wind direction. Smoke can reduce visibility (e.g., making it more dangerous to drive) and can lead to respiratory distress (Cisneros, Alcalá, Schweizer, & Burke, 2018). Recommendations to stay indoors and avoid aerobic exercise are often the antithesis of why people are attracted to the region.

“(We) let people know to shelter in place. The air quality will be better in the buildings, they are safer in the buildings than on the road.” South Lake Tahoe Focus Group & Interviews

The ominous smoke can heighten a sense of fear which is often magnified by sensational media reports that create the perception that the whole region is burning.

“People call and ask if it is smoky here, then decide if they’ll come up.” Angels Camp Focus Group & Interviews

The growing scope of wildfires in California is bad news for tourism. More frequent or larger fires have been associated with relatively larger decreases in short-term tourism revenues (Prudencio et al., 2018). Given that the largest wildfire related negative economic effects often occur “in tourism-dependent rural economies”, this economic impact is likely being magnified in the Sierra Nevada region, (Kim & Jakus, 2019, p. 34).

Results from a two-part economic impact analysis of wildfire on tourism we conducted on the Sierra Nevada region are described below. The first section analyzed changes in traveler generated taxable sales and how wildfire and other factors influenced these. Key findings were:

- Economic dependence on tourism varies greatly by county in the region. For example, over half of taxable sales in Mariposa County were travel related and the county was ten times more dependent on these than Butte County, which was just below the regional average.
- Regionally, traveler spending increased every year between 2014-2019, but the growth rate declined 2.5% in 2018. This decline is attributable to wildfires in the region that year.
- Mariposa County annual change in travel generated taxable sales were 12% less in 2018 and 5% less in 2017, compared to the regional average for those years. While annual change in travel generated taxable sales 2018 and 2017 in Butte County exceeded the regional and state averages.
- Differences in 6 key wildfire characteristics, and the infusion of over \$1 billion in funding for the Oroville dam reconstruction and rebuilding of Paradise explain differences in 2018 and 2017 annual changes in travel generated taxable sales in Mariposa and Butte Counties.

The second section of the economic analysis created and tested a wildfire and tourism economic impact model. It analyzed the impact of the 2018 Ferguson fire on Mariposa County. Key results were:

- The 2018 Ferguson Fire, which closed Yosemite National Park for three weeks during the peak tourist season, resulted in an estimated \$46 million decrease in visitor direct and indirect spending in Mariposa County.

- There was an estimated \$1.1 million reduction in 2018 local government tax revenue in Mariposa County from the fire.

Surveys of California residents and nonresidents, conducted as part of this research, documented Sierra Nevada visitor travel patterns and how wildfire affected these. See Appendix A for a summary of survey findings on how fire impacted visitation, or the full report (Wilson, 2020) for detailed results. The nationally representative survey of nonresidents found that 28% had considered or visited the Sierra Nevada region since 2014. Nature-dependent activities were most popular and undertaken by at least four in ten nonresident visitors to the Sierra.

“Scenic driving, hiking and nature photography were the most popular activities of nonresident visitors.” Nonresident Survey (Wilson, 2020)

Over 84% of residents were *very aware* of wildfires in the Sierra Nevada region. About half (43 to 49%) of these residents indicated that fires were bad for local scenery, tourist-serving businesses, local forest health and outdoor recreation opportunities. In excess of half (53%) of residents indicated the potential for wildfire in the Sierra Nevada impacted if they would recommend a visit to the region. Despite being less familiar with California, 22% of nonresidents were concerned about wildfire and its impact on their travels.

One in five nonresidents who considered a visit agreed wildfire impacted their decision to visit to the SN region since 2014.” Nonresident Survey (Wilson, 2020)

The most frequently mentioned impacts by nonresidents from fire were: they changed destinations in the Sierra (35%); cancelled their trip (27%); left the region early (19%) and changed accommodations to avoid smoke (14%). Over 42% of nonresidents indicated the potential for wildfires will influence their interest in visiting the Sierra Nevada region in the future. Survey results document that wildfire has significantly influenced past travel to the region and will most likely continue to do so in the future.

Most wildfire-related economic impacts are short-term, during the fire to within 1-3 weeks after containment. However, there are indications, derived from nonresident surveys and focus groups, of longer-term adverse impacts. Nearly one in four of all the summer/fall leisure trips to the Sierra Nevada by nonresidents over the last 5 years were influenced by wildfire considerations, and this is expected to continue in the future without mitigation measures, such as improving forest health and management. Other specific long-term impacts identified in reports include:

- Increased hesitation to visit the region by tourists due to reductions in the destination image in summer and by skiers deterred by dead trees which could take years to recover;
- Destroyed tourism infrastructure that has not been rebuilt (e.g., the covered bridge near Paradise) or will take several years to get funds/insurance settlements necessary to rebuild;
- International tour operators not including destinations in the Sierra Nevada in future tourist packages, as seen in Yosemite National Park area, due to increased wildfire-related uncertainty and lost bookings;
- Continued danger from standing-dead trees in back county recreation sites; and
- Small tourism businesses going bankrupt, reducing planned improvements or taking several years to financially recover from a severe fire.

Ultimately, tourists seeking outdoor recreation are much less likely to visit burnt forest landscapes and will likely shift their future activity to new locations.

“On Forest Service lands there appears to be a long-term impact of people shifting to a new backcountry area when displaced by a fire, from places they have traditionally visited. They discover a new car accessible recreation site and continue going there in future years versus going back to their traditional areas.”
Angels Camp Focus Group and Interviews

“This fire had over 600,000 trees that were burned to where they're dead or dying, and 100,000 taken out by PG&E, another 60,000 by the other jurisdictions in the area. That still leaves about 400,000 trees that are of danger for everyone for the next five years.”
Chico Focus Group and Interviews

Most small tourist-serving communities and counties in the Sierra are very vulnerable to the impacts of wildfire. The Economic Impact Report shows that over half of the taxable sales in Mariposa and Mono counties, and about one quarter in Sierra, Alpine and Plumas counties come from travelers. The preponderance of tourist businesses in small communities are small and locally owned with limited financial resources. Focus groups documented that many of these types of businesses had been particularly hard hit by recent wildfires. It can take years to recover financially from a severe fire. Small tourism business problems translate into less spending in the community and lower local government tax receipts and services.

“Over 80% of our business income comes during July and August. We were shut down or highly affected for one month. The fire resulted in a 70% reduction in sales for the entire year. It was devastating.” Mariposa Focus Group and Interviews

Even ski resorts, which also depend on summer visitation, find that burnt areas along ski runs present tree fall danger to skiers for years and reduce the scenic quality and appeal of the area as a ski summer destination.

Wildfire impacts have implications for visitation to not just the Sierra Nevada region but also to the state of California. When key state attractions for international visitors, such as Yosemite and Lake Tahoe, are impacted by fire, potential or en route international visitors could change their plans or cancel their visit to the state. This could affect many areas in the state. For example, if they did not fly into Los Angeles or San Francisco gateways, and instead flew into Las Vegas and visited the Grand Canyon, these gateways and other destinations, such as Napa, would be affected.

There is growing concern in the Mariposa area that the increased frequency and severity of wildfires and power shutoffs are making international tour operators reconsider bringing groups to the Yosemite National Park area. During the 2018 Ferguson fire, an international online booking company cancelled all reservations to the Yosemite area.

“International tour operators are getting gun shy about this area (Yosemite), from the power shutoffs to fires (impacting their groups). One told me they will not bring groups here in the future.” Mariposa Focus Group and Interviews

Study Objectives and Components

The Sierra Nevada Conservancy's (SNC) mission is to encourage, and support efforts that improve the environmental, economic, and social well-being of the Sierra Nevada Region (SNC, 2020). In an effort to better understand the impact of wildfire on tourism in the Sierra Nevada region. The SNC contracted San Francisco State University and Lake Tahoe based

SMG Consulting to study the issue. The overall purpose of the comprehensive analysis was to understand the range of wildfire impacts on tourism and its economic effects in the Sierra Nevada region.

The research consisted of four parts. Part I was a review of related research and media reports (Wilson, 2019). Part II collected over 1,200 survey responses from California residents and nonresidents to understand the experiences of and attitudes towards tourism and wildfire in the region (Wilson, 2020). Part III consisted of qualitative reports of focus groups and individual interviews from multiple Sierra Nevada communities conducted between November 2019 and February 2020. These interview data were then combined with additional research about particular Sierra Nevada communities that have been affected by wildfires to create case studies.

Focus Group and Interview Reports

- Ribaldo, C. (March, 2020). South Lake Tahoe: Focus group and interview report
- Ribaldo, C. (March, 2020). Mono County and Mammoth Lake: Focus group and interview report
- Tierney, P. (December, 2019). Chico focus group and interview report
- Tierney, P. (December, 2019). Mariposa focus group and interview report
- Tierney, P. (January, 2020). Angels camp focus group and interview report
- Tierney, P. (January, 2020). Sutter Creek focus group and interview report.

Case Studies

- Ribaldo, C. (March, 2020). Lake Tahoe case study: Wildfire impacts report
- Ribaldo, C. (March, 2020). Mammoth Lakes/Mono County case study: Wildfire impacts report
- Tierney, P. (February, 2020). Butte County case study: Wildfire impacts report
- Tierney, P. (March, 2020). Mariposa County case study: Wildfire impacts report

Part IV was the identification of the impact of wildfire on regional tourist expenditures and its relationships with wildfire. The second section developed an economic impact model and tested its application to one Sierra tourism destination to estimate the financial impacts from one large 2018 wildfire (Tierney & Ribaldo, 2020). Key findings from the economic impact study included:

- Six counties in the region had at least 20% of their 2018 taxable sales generated by travelers. Mariposa and Mono Counties had over 53%, indicating their economies are highly reliant on visitor spending.
- Wildfire incidents were linked to a 2.4% decline in 2018 traveler spending for the Sierra Nevada region and 12% loss for Mariposa County. But wildfire did not have significant tourism economic impact for all years, all counties or past large fire events.
- Seven factors were identified which had the greatest influence on wildfire related tourism economic impacts.
- A model to the project the economic impact of wildfire on tourism was developed and tested for the 2018 Ferguson fire's impact on Mariposa County. The provisional model results estimated the fire caused a direct and indirect spending loss of \$45.1 million and a reduction of \$1.1 million in visitor related local government taxes in Mariposa County that year.
- Longer term impacts on regional tourism from wildfire were identified but it was not possible to quantify these extended economic effects.

The purpose of the following report sections are to introduce, describe and justify a set of recommendations for policy and other decision makers.



**Figure 2. 2013 Rim Fire near Yosemite National Park
(Earth Observatory, NOAA.gov)**

Recommendations for Action

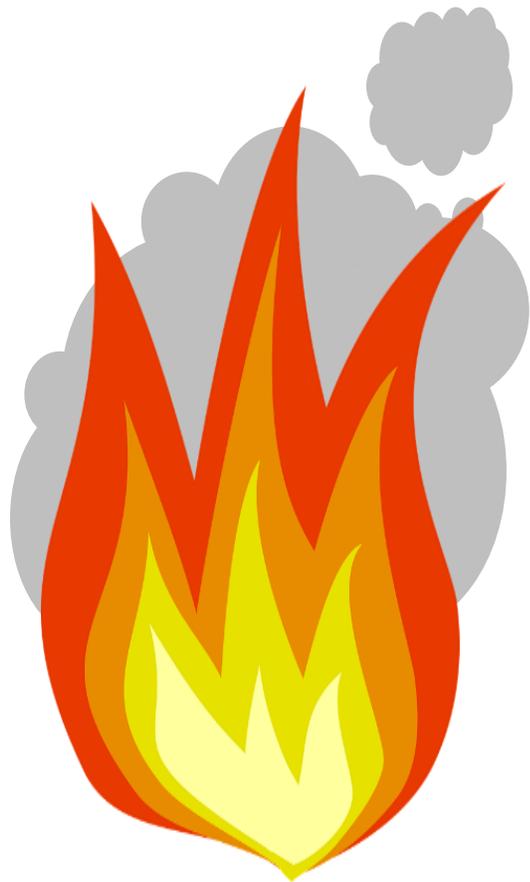
There are a number of recommended actions that flowed from this research project. Recommendations focus on communication and education, technology, forest health, developing financial support, influencing work rules, and future research.

Communication & Education

Pre-fire

Nested Communication Networks

Others have reported about the need for creating groups that include different public and private fire organizations to increase wildfire preparedness (e.g., Hamilton, Fischer, & Ager, 2019). Similarly, the US Forest Service is conducting a study to develop effective strategies to create partnerships to address wildfire risk (USFS, 2020a). The current study supports the need for nested communication networks. This recommendation was developed based on interview and survey data.



INTERNATIONAL
<ul style="list-style-type: none"> • Potential Tourists
NATIONAL
<ul style="list-style-type: none"> • Federal government (NPS, BLM, USFWS, USFS, NRCS, FEMA) • Tribal government • Private (Foundations, other NGOS such as American Red Cross) • Potential tourists
STATE
<ul style="list-style-type: none"> • Government (Sierra Nevada Conservancy, CAL FIRE, Visit California, Governor's Office of Emergency Services, CalEPA, Cal/OSHA, CalTrans) • Private (Foundations, other NGOs) • Potential tourists
REGIONAL
<ul style="list-style-type: none"> • DMOs (Destination Marketing Organizations) • Potential tourists
LOCAL
<ul style="list-style-type: none"> • Government (Mayor, City Council, Supervisors, Police, Firefighters, General Services) • Private businesses • Residents (Most vulnerable to the health or economic effects) • Current tourists

Figure 3. Nested Communication Networks

Group and individual interview participants indicated that some Sierra Nevada communities have developed more collaborative communication networks, while others are less collaborative and effective. For example, a Public Information Officer (PIO) process was developed in the Mammoth Lakes and South Lake Tahoe areas. Representatives from local government, the sheriff's office, Office of Emergency Services, US Forest Service, and the tourism industry all meet before fire season and during any incidents to share information and coordinate responses. The key is to meet and establish consistent processes before a wildfire event rather than trying to establish these relationships and standards in the heat of the moment. Moreover, these continuous collaborations support experiential learning and continued refinement.

Local Destination Marketing Organizations (DMOs) often take charge of tourism communications about their area to the media and local businesses.

“During the Lions Fire, we got together through a Public Information Officer (PIO) meeting group with various agencies: Tourism, Town, Forest Service, Sheriff's Office, CHP, Public health, etc., which came from a lack of communication. Need? More of a concerted effort of who was saying and doing what. Trying to make sure tourism wasn't sugar-coating a big event, and that public health wasn't all doom and gloom. Get the communication somewhere in the middle.” Mammoth/Mono Focus Group & Interviews

However, the pace of a wildfire event with real-time information coming from both public and private sources may make it challenging to coordinate messaging.

“As soon as we are aware, we try to get whatever information is out there, which sometimes comes from MLT, sometimes the Town, sometimes the fire department – whoever has the message out first to the business community.” Mammoth/Mono Focus Group & Interviews

Moreover, different organizations may have different mandates for communication.

“I don't know that the Forest Service is really bought into the network of communication because when they try to communicate, they get 'shot.' It doesn't help motivate the forest service to pick up the phone and call and (I am) not sure that they have obligations to do that. But the region needs to work together, and we need them to call us. Because they don't necessarily know how many people are in town, events, etc. And also, they need to make that decision faster – manage it or put it out.” Mammoth/Mono Focus Group & Interviews

Part of the collaboration that needs to occur before an incident is to develop the relationship and develop protocol to embed a tourism representative in the Incident Command Team (ICT) once a fire starts. See a detailed discussion of embedding a tourism representative in the ITC discussed later in this report.

These communication challenges can be, at least partially, mitigated by organizations connecting within and across levels. Although these connections are especially important at the local and regional level, there is also value at connecting across levels. It is not enough that government agencies, private businesses, and individuals at a particular location connect, it is also important that there is communication with representatives at the regional and state level. Such communication is beneficial because groups at the various levels have different roles to play. For example, while there are some firefighting resources at the local level, there are many more resources for fighting large fires at the federal level. The USFS has land units (hand crews, hotshots, engine crews) and air units (smoke jumpers, helitack) for fire suppression and management (USFS, 2020b). Similarly, regional DMOs may have different resources compared

to state or national organizations that support tourism. When organizations understand what role each of the other organizations can play before, during, and after a wildfire event they can more effectively communicate and collaborate.

Establish How Messaging will be Communicated to all Parties

In order to most efficiently operate during a fire event, groups need to develop and educate all parties about what, when, and how communications will occur during and after a wildfire event.

“EMPOWER PEOPLE – a strategic effort that changes the game. Information is the primary tool, what you’re really trying to do is empower everyone – visitor, local, business owners – so that they can figure out what they need to do and how they react. The problem is, how do you get that done? Who talks to Small businesses? If this is your new operating environment, how do we change and adapt to it to minimize the impact.” S Lake Tahoe Focus Group & Interviews

Private and public organizations need to know where they can access information in case of a fire and how to interpret that information. Our results suggest that some organizations may need to shift how they communicate to be more effective for all audiences.

“Communication is something I have been trying to work really hard on with the USFS in particular. No one can interpret the military language they use on Inciweb. I think trying to set a better standard for clear communication on what they are doing on the ground” Mammoth/Mono Focus Group & Interviews

Assuming that the USFS has a reason why they are using technical jargon, then it would be beneficial for them to create another webpage aimed at a more general audience.

Second, it needs to be decided how this communication will flow to all of the affected individuals and organizations. Our results suggest that it is more difficult to contact tourists than it is to establish communication with local residents. Furthermore, it may be even more difficult to communicate with incoming tourists that are not currently in the area and may not necessarily have already booked accommodation in the area.

“Over the last few years we have met with the Visitor’s Authority and interested parties on how to get the information out to people. Ideally, we don’t want people to panic and leave the basin. If visitors are in hotel rooms that is probably the safest place for them to be to reduce evacuation challenges. If we get them out on roads, then that tends to be a problem because then we have the evacuation of residents from the area of the fire plus the congestion of flushing out the casinos on the roads.” S Lake Tahoe Focus Group & Interviews

One method to increase targeted messaging would be to have visitors voluntarily register to receive fire update information via text or email.

“Residents receive ‘Calaveras Alert’ from the county, sent by text, about evacuations and closures. We are working on a tourist version.” Angels Camp Focus Group & Interviews

This opportunity could be advertised through the websites that visitors use to plan their vacations as well as at the restaurants, gas stations, and overnight accommodations in the area. In addition to that targeted communication, electronic billboards could advertise the opportunities to drivers coming into the area.

“There needs to be education of vacation rental owners (i.e. AirBnB) and to post information in their facilities on what guests should do in case of a wildfire and a planned power shutoff.” Angels Camp Focus Group & Interviews

“Emergency instructions and resources should be placed in every hotel room.” Angels Camp Focus Group & Interviews

Update Emergency Plans, Especially for Small Businesses

Small tourism businesses and nonprofits have been hard hit by recent wildfires, and it will likely take a long time for some of them to recover.

“And aside from losing all the (museum) artifacts and the building, we lost a docent in the fire. And most of our docents were retired and elderly. They have since moved away like many of our volunteers have moved away.” Chico Focus Group & Interviews

“We were shut down or highly affected for one month. The fire resulted in a 70% reduction in sales for the entire year. It was devastating to our small business.” Mariposa Focus Group & Interviews

An emergency plan for how to operate during a fire event is imperative for both public and private organizations.

“Some businesses are updating their business plans based on wildfire threats—absolutely.” Angels Camp Focus Group & Interviews

“The Kennedy Mine now has a fire break and a fire camera for the first time ever.” Sutter Creek Focus Group & Interviews

Although most local government agencies have emergency plans, comments from focus groups and interviews suggest that those plans are not always regularly updated. Some small businesses lack any emergency plans/preparedness and need incentives and assistance with creating emergency response plans, as well as help to train staff for emergencies.

Influence and Communicate About Intentional Power Outages

Another area where the nested communication group can influence is the process guiding intentional power outages. PG&E explains that such Public Safety Power Shutoffs (PSPS) are conducted, “when gusty winds and dry conditions, combined with a heightened fire risk, are forecasted” (PG&E, 2020). The current study’s survey (Wilson, 2020) indicated that regional electricity blackouts had the least amount of support compared to all other wildfire prevention measures. Both California residents and nonresidents expressed relatively low levels of support for such power outages.

“Make PG&E responsible for the damage they create and for the poor management that has gotten them to the point where their only option to avoid liability is cutting people’s power- many of whom require electricity for daily life (elderly, sick, etc.)” Survey

“PG&E should not shutoff power in areas with little fire danger.” Angels Camp Focus Group & Interviews

These power outages affect businesses as well as individuals residing in the area and tourists.

“We send visitors to a local PG&E Resiliency Center during a planned power shutoff.”
Angels Camp Focus Group & Interviews

“PSPS (Public Safety Power Shutoff). The power companies are saying it is going to take three years to get fixes in place, which form perception and standpoint the community does not have. They are sending out a large number of notifications that our visitors aren’t necessarily getting but if they hear about because there are so many notifications, it will really influence their travel.” Mammoth/Mono Focus Group & Interviews

“I have had to rent a generator for one week (during planned power shutoff) that cost us \$15,000. Since then we bought a large \$75,000 generator that is big enough to power our golf course and another \$125,000 generator to power our lodge and restaurant. That was a big impact on us.” Angels Camp Focus Group & Interviews

Similar to the frustration identified in the current study, public outrage has led to suggestions by politicians that PG&E should be converted into a public utility (Alphonso III, October 30, 2019). Therefore, it may be an opportune time for the nested communication networks to impact the communication and operationalization of intentional power outages.

Encourage Acquisition of Preparedness Equipment

Power outages have necessitated the need to purchase generators, but generators are not the only equipment that people may need. The nested communication networks can educate individuals (tourists and locals) and businesses about what equipment they should acquire to be more resilient during fire events. It is important that such messaging should inform rather than sensationalize.

“There is a fine line when you are marketing a destination and saying everyone’s welcome but make sure you have your fire supplies. I know that if I was looking to travel somewhere and they told me that I would probably change my mind about traveling there. There is a fine line between education and scaring.” S Lake Tahoe Focus Group & Interviews

Beyond the acquisition of prepared equipment by individuals and businesses, additional expensive equipment may need to be acquired at the regional level. Such equipment could then be deployed to meet local needs during or after a wildfire event.

Encourage Smart Development & Maintenance

How communities build new homes and businesses and then rebuild after a fire will influence potential future fire impacts. A multi-use approach that includes developing fire preventative development that enhances tourism is warranted. The Town of Paradise is a good example of how this can be done.

“Paradise is re-visioning its roads and trails. One of the things that we have discussed are multiuse pathways that could be trails and resident evacuation routes or could be used by emergency vehicles during evacuations. Also the idea of using new recreational trails as fire breaks around the community and as a tourist attraction is being considered.” Chico Focus Group & Interviews

Most (80%) survey respondents thought it was appropriate to limit building houses and other human development in fire-prone areas. Moreover, that percentage did not vary much for California resident (81%) or nonresident (79%) respondents. Even 83% the subsample of Sierra Nevada residents supported such restrictions.

“Too many houses are being built in wilderness. Wildfires wouldn’t be so dangerous if there weren’t so many houses in the Sierras.” Survey

Therefore, it would be appropriate for the nested communication networks, including the SNC, to influence local and state building codes.

Additionally, owners of existing structures may need to be educated and encouraged about the most effective fire prevention steps for their property.

“Reaching out to second homeowners about what prescribed fire means, how is that a part of making the community safer, what you can do on your property – to me people feel empowered, I can do some things on my property and in partnership with my neighbors and not wait for the fire department to save me; that does give people an empowering feeling.” S Lake Tahoe

However, it should also be noted that many classic steps to encourage homeowners to take needed emergency preparedness and fuels reduction actions have not always worked. For example, Syphard & Keeley (2019) found that neither the presence of “defensible space” nor enclosed eaves had a significant impact on whether structures were damaged in wildfire events. Moreover, it may be necessary to influence local and regional regulations to promote the most effective preventative practices.

“Help make it easier for landowners to clear brush and dispose of it to reduce fire danger.” Angels Camp Focus Group & Interviews

Encourage Fuel Reduction

Another, sometimes misunderstood, wildfire prevention technique is prescribed or controlled burning. The National Park Service describes prescribed burns as, “one of the most important tools used to manage fire today” (NPS, 2020). NPS describes how it is a relatively cost-effective way to reduce fuel loads in natural areas to prevent catastrophic wildfires. Statements from a focus group and our survey echo this sentiment.

“We’ve seen no impact on visitation from prescribed burns we’ve conducted in the park. People are very supportive.” Mariposa Focus Group & Interviews

“Controlled burns are the most effective way to manage forests and make them available to tourists and future generations.” Survey

In contrast to the regional electricity blackouts which 15% of all respondents and 23% of Sierra Nevada residents did not support, only 6% of all respondents did not support prescribed burns (Wilson, 2020). Therefore, while it was not as popular as increased funding for people and resources to fight wildfire, it was much more popular compared to regional electricity blackouts.

Unfortunately, prescribed burns were suspended in early 2020 due to the COVID-19 pandemic (Alexander, March 25, 2020). That failure to decrease fuels coupled with an extraordinarily dry winter may lead to an extraordinary fire year during summer and fall 2020 (Alexander, April 1, 2020).

Another option for clearing trees and brush is logging. Clear cutting or thinning of trees around Sierra towns and roads saw a similar level of support as prescribed burns among all respondents to our survey (77% supported; Wilson, 2020). This type of selective logging had an

even higher level of support among Sierra Nevada residents (86% supported). A comment from the survey explains this support.

“The Sierra Nevada area is a wonderful area to go to and enjoy the beautiful area. Though you need to understand when logging and forest management is not allowed to protect the area you will have more hotter fires being more destructive.” Survey

Another aspect of logging is removing standing burned trees after a wildfire event. Removing such dead trees can promote safety and provide an economic benefit.

“After the fire, I logged some of the burned trees and made some money to help make up for lost winery revenue.” Angels Camp Focus Group & Interviews

The nested communication networks should educate organizations and individuals about why fuel reduction through the use of prescribed burns and targeted removal of live or dead trees and brush is occurring and how such actions are beneficial to wildfire prevention, outdoor recreationist and motorist safety, and economic health.

Communicate Preparedness and Prepare to Communicate Impact

DMOs necessarily often focus on fun rather than safety; however, publicizing what individuals and organizations are doing to prepare for the next wildfire event has multiple benefits. First, it educates others about what steps they can take and creates a social norm to promote that activity. Second, knowing that there are steps being taken to prepare for wildfire could reassure anxious residents and visitors. Third, communicating that this action is being taken may make decision makers more sympathetic to a community if they are affected by wildfire.

Local communities may also want to prepare to communicate the impact of wildfire on their community. Having regular high-quality images of charismatic views can facilitate before and after image comparisons if a landscape is burned or temporarily marred by wildfire smoke. Text based information describing the community can be prepared and reviewed by many members of the community before a wildfire event, so that it is available to be used in press releases during a wildfire event.

Prepare a Tourism Economic Impact Study for Each Large Fire

One effective way that the impact of fires can be communicated is through an economic analysis of wildfire events. Our survey results indicate that summer was the most popular time to take a vacation to the Sierra Nevada region and that the trips lasted an average of nearly 4 nights (mean of 3.8 nights; Wilson, 2020). Nonresident respondents reported that their party spent an average of \$915. The averages were estimated based on data provided by nonresident respondents for different expenditure types (e.g., overnight accommodation) from their latest trip to the region. It may be that this estimate is inaccurate because the event was not very recent and they could not recall the exact values. Therefore, it would be wise to compare these findings with data collected in the moment (diary studies) and revealed behavior (records of actual expenditures rather than stated expenditures). Further, this is an average across multiple communities. It is assumed that the largest expenditure category, overnight accommodations, will vary greatly depending on the type of overnight accommodations available. Average spending on overnight accommodations will likely be lower in a community that only has camping compared to a community with a luxury resort.

Steps can be taken before fire events to secure the data needed to populate the economic impact model. Although some data are available after the wildfire events, other data may be more available before an event occurs. Gathering data before the event would avoid the loss of data and increase estimate accuracy. Furthermore, standardization of what data collection should occur and instrument development (e.g., surveys) can make data collection

during a wildfire event more efficient and complete. Additionally, it would make it easier to compare the impact on different communities and sum overall impact. To support this outcome, we have created a model based on our survey and destination data to estimate the economic impacts of wildfire on tourism from the 2018 Ferguson Fire on Mariposa County (Tierney & Ribaldo, 2020).

During the fire

Goals

The overall goal during a wildfire event should be to ensure that all parties are receiving **consistent, accurate, current, and clear information**. Previously established communication strategies should be deployed to reach and impact the greatest number of individuals and organizations. The problem is that organizations and individuals are currently receiving information from multiple sources and that information may be inconsistent, delayed, or not consistently interpreted in the intended manner.

“I have a problem with the maps, for instance when you look at CAL FIRE and you look at the perimeter the perception is that everything is ablaze at the same time when really some of that has been put out and there is only a certain portion actively burning. People aren’t savvy enough to figure out how to read the map.” S Lake Tahoe Focus Group & Interviews

“I’d like a consolidated comprehensive online source for local fire information.” Angels Camp Focus Group & Interviews

“We should have a daily wildfire and smoke report, like the 5am snow report.” Angels Camp Focus Group & Interviews

Part of the issue, and a potential solution, is that hospitality businesses and other organizations that directly interface with tourists and other individuals **get their information from different sources**.

“Air quality management districts and TRPA keeps a forecast and 48-hour mapping up, like the weather forecast, to give you an idea of the predictions. We have tools available that can show people, and we can get those to LTVA, and the chamber have those sources to point guests to.” S Lake Tahoe Focus Group & Interviews

“I get information about fire conditions and closures from the Inciweb website (<https://inciweb.nwccg.gov/> - an interagency all-risk incident information management system) which has fire information from the BLM, Forest Service and CAL FIRECAL FIRE. I did not communicate much with the local visitors’ bureau because we work in many locations.” Angels Camp Focus Group & Interviews

“I use the CAL FIRECAL FIRE website (<https://fire.ca.gov/>) showing the location of fires.” Angels Camp Focus Group & Interviews

“At the resort we get information on the fire status from any and all sources, including the visitors’ bureau, chamber, TV and social media.” Angels Camp Focus Group & Interviews

“The local radio station KKPN gives information. Their slogan is “When a fire breaks out we break in.” Angels Camp Focus Group & Interviews

“We get daily briefings from the city and supervisors send out text messages.” Angels Camp Focus Group & Interviews

“I count on the Calaveras Visitors Bureau to send fire information, and they are doing a good job getting information out to tourism businesses.” Angels Camp Focus Group & Interviews

Given that people are getting their information from multiple sources, it is important to take steps to unify that message so that individuals are not receiving contradictory information due to misinterpretation, time lags, or the spread of false information.

The primary content of the all communication during a fire event must be focused on safety and the minimization of destruction of property.

“Media warnings to stay away when the fire was burning next to town were helpful to keep visitors away.” Angels Camp Focus Group & Interviews

Steps should be taken to increase the probability that messaging at the organization level is consistent as possible. For example, there might be some specific messaging about action that businesses and individuals should take when visibility is impacted by smoke.

“We have an obligation to be safe first and foremost and so we just do our best. There were days that we had to close down boat rentals; if we couldn’t see a quarter mile out there, we are not going to send them into the abyss, and the same with fog. We are going to operate safely first.” S Lake Tahoe Focus Group & Interviews

Special efforts should be made to contact tourists. Zajchowski and colleagues (2018) found that smoke from wildland and prescribed fires had a relatively large impact on tourists because, unlike locals, they had less knowledge of ways to avoid the impacts of the smoke.

“We need a clearinghouse for tourists to get fire information that is local and relevant to them.” Angels Camp Focus Group & Interviews

Although it is critical to focus on the primary goal of safety, it is also important to consider how messaging can increase fear, which could lead to a decrease in tourism or otherwise economically damage the area in the longer term. Although the direct messaging from responsible agencies could increase anxiety, our data suggest that consistent and clear messaging is needed to counter a tendency by **media sources to sensationalize** the extent (i.e., the whole region is burning) and intensity of a fire event (i.e., suggesting a region has burned down rather than experiencing just a couple of days of smoke). Our survey results (Wilson, 2020) found that among the nonresidents who considered wildfires, traditional media (e.g., television, radio, newspaper) and the internet or social media were the most frequently mentioned sources of information.

“When the Angora fire happened, the media grabbed hold of it and made it sound like the entire Basin was burning and getting business back here afterward was just as important. That message that goes out after to remind everyone we are open and the whole place did not burn down is just as important.” S Lake Tahoe Focus Group & Interviews

“If you look at Australia and they have a map of the fires up and it’s almost the whole country, that does something to your brain and it’s like, ‘man I don’t want to go there.’” S Lake Tahoe Focus Group & Interviews

Another consideration is whether to **fully suppress or manage a fire**. Fires could be allowed to burn to provide fire breaks (similar to the function of prescribed burns) or for other ecological or risk factors.

“Manage the forests as they Indians managed them and they’ll be fine. They need to burn moderately every few years.” Survey

However, managing, rather than fully suppressing, a fire equates to more days of smoke in the region. Moreover, there is always the possibility that managed fires can get out of control.

“If you allow people and businesses to reside in the area. You must take action to limit the risk. If you are not going to limit the risk to humans then you must restrict the area from humans.” Survey

“Do not let natural fires burn their course as they did in Yellowstone. Look at Australia. They thought they should let the fire burn because it was natural. It took over the whole country. Bad idea.” Survey

Conversely, conducting controlled burns and managed fires received strong endorsement from most survey respondents, with over 80% supporting these actions to reduce the risk of wildfire. In addition, nearly half of resident survey respondents indicated recent wildfires have had bad effects on local scenery, tourist-serving businesses, local forest health and local outdoor recreation opportunities. A balance between a managed fire, which may have a smaller longer impact, and the forest health and tourism benefits from management, which reduce the risk of catastrophic fires and provide other benefits to the region and state (see the report section on Forest Health and Appendix B), is important to consider. Organizations that are part of the nested communication network should be consulted to inform incident command about the economic impact of managing rather than suppressing a fire.

Our evidence about the **sensitivity of tourism to wildfire is mixed**. Some participants from the focus groups and interviews believed that tourists are relatively sensitive to the effects of wildfire.

“For transient summer business, people modify their plans when fires are nearby, or it is smoky. They will stay away if it is perceived as unhealthy.” Angels Camp Focus Group & Interviews

However, survey responses from both California residents and nonresidents did not indicate that wildfires had a major impact on their decisions regarding tourism in the Sierra Nevada during summer or fall (see Appendix A and Wilson, 2020). Most (86%) of California residents said they would recommend traveling to the Sierra Nevada region during summer and fall and they reported that this recommendation was not strongly impacted by concern about wildfires. This is despite the finding that most (84%) California residents indicated that they were aware of wildfires and all (100%) of the subsample of respondents from the Sierra Nevada region reported that they were aware of the fire and that most (70%) had been negatively impacted by wildfires.

Similarly, most (78%) nonresident respondents that traveled to the Sierra Nevada region did so for leisure reasons (i.e., vacation, recreation). Similar to previous studies (e.g., Palmer & English, 2019), the survey found that most of these nonresident tourists engaged in activities that were dependent on natural landscapes; scenic driving (68%), day hiking or backpacking (48%), and/or natural photography (39%).

“Wonderful landscapes, great views, very enjoyable experience to visit.” Survey

Despite these findings that nonresident tourists are likely visiting for discretionary leisure travel to engage in landscape dependent activities, only about one-fifth of nonresident respondents reported that wildfires were a consideration when they decided to travel or not travel to the Sierra Nevada region during summer or fall since 2014.

Rather than cancelling a trip, respondents to our survey that did consider wildfires (Wilson, 2020) indicated that it was more likely that they would shift locations, shorten the trip or change accommodations on their trip.

“(We) talked a lot about how the negative impacts of fire affect tourism, but last November there was a huge influx of tourism into our community that was unexpected and quick and right before Thanksgiving. It was an interesting byproduct of a different type of wildfire in a different location.” S Lake Tahoe Focus Group & Interviews

The issue that most frequently impacted (86% of nonresidents) these changes in plans or cancellations was concerns about the effects from smoke (e.g., decreased visibility, health effects). Closure of outdoor recreation areas and lack of infrastructure due to wildfires were concerns to over 83% of survey respondents.

Although it is good news that a minority of potential tourists appear to be sensitive to wildfire impacts on trip participation, a 20% decrease in regional tourism due to concerns about wildfires can amount to a large number of visitors lost and substantial negative economic impact. For example, if 20% of the 4.4 million annual visitors to Yosemite National Park were to cancel or shorten a planned trip, this would impact 880,000 visitors. In fact, our tourism wildfire economic impact model (see Appendix A) developed and tested on the 2018 Ferguson Fire in Mariposa County, estimated a decline in direct and indirect visitor spending of \$45 million and a loss of \$1 million in local government tax receipts (Tierney & Ribaldo 2020). In addition, focus group results from Mariposa indicated the impacts to many small businesses with a short operation season were severe. So smaller percentages of people who say their trip planning was impacted by fire does; therefore, even if the majority of respondents’ choice to travel was not impacted by wildfires, the economic impact to tourist-serving businesses and local governments can be quite severe.

The effects from wildfire on future trip planning are substantial. Over 42% of all survey respondents indicated the potential for wildfires in the Sierras would influence a future visit to the region.

Further research should investigate if individuals become more sensitive to wildfire effects in the region as the date of their trip approaches. Laboratory experiments using simulations or surveying individuals one week before a planned trip in the Sierra Nevada region are two ways to gather further evidence to investigate this issue.

Content

The most basic content is letting people know by text, photo, and video **where the smoke and flames currently are and where they are expected to be in the future**. This information needs to be accompanied by **recommended and required safety actions**. This information must be sophisticated enough so that individuals can apply that information to their individual cases.

“We just try to be totally honest with the guests, usually yes, there is a fire and yes there are periods of smoke. The next question is typically ‘is it safe’ and the only way to quantify that is to ask the guest if they have a breathing problem – if you have asthma, yeah it might not be the best time to come or maybe you have to alter the way you recreate.” Mammoth/Mono business owner

The messaging needs to differentiate between recommended adaptations and mandatory requirements. Is this a mandatory evacuation or a recommendation to leave the area if possible? Recommended adaptations could include changing activities (e.g., avoid aerobic exercise outdoors), accommodations (e.g., rather than camping you should stay indoors in a room with filtered air), locations (e.g., since this location is experiencing smoke, you might consider these other locations that accommodate similar experiences), and transportation.

“The Camp Fire (in Butte County) gave Calaveras County more tourists because they were looking for a less smoky place to visit.” Angels Camp Focus Group & Interviews

“During the Napa and Sonoma fires, people were displaced and ended up coming here.” Angels Camp Focus Group & Interviews

“Tourism should come up in busses & transit to reduce traffic so firefighters & ambulances can get to problem areas easily.” Survey

Another important part of the message is **differentiating between smoke from prescribed fires and smoke from wildfires.**

“We have the Tahoe living with Fire website that shows any fuel projects or prescribed fires so if people see smoke, they can go there to determine if it is smoke they need to worry about or ‘good smoke.’ Working on tying that in together with the Alert Tahoe Camera network, because we have people that watch that as a hobby and then see smoke and the phones start ringing off the hook. We want those people to connect the two easily.” S Lake Tahoe Focus Group & Interviews

“There should be a website (state or federal) that list potential dates of controlled fire burns. List condition of areas such as recent burn, or a time when last wildfire. Also condition of the area, heavy burnt, slight signs of burn, in growth mode and easy to hike or walk or drive.” Survey

Educating individuals and groups about the benefits of controlled burns may further reinforce the message that the region is taking steps to be as prepared as possible.

“I think control burn is a positive message of us being progressive, something we can talk about as a general education component to our guest base. Tahoe is safer because of what we are doing.” S Lake Tahoe Focus Group & Interviews

“We have a group of concerned citizens that really rail against prescribed fires. They don’t understand the need and that fire is a part of the ecosystem. There is a need for education.” S Lake Tahoe Focus Group & Interviews

Another potential difference between wildfires and controlled burns may be the health impacts of the smoke. Assuming that controlled burns are only done in relatively stable conditions which require less chemical suppression and that controlled burns are not burning through structures and agricultural areas, smoke from controlled burns may likely have fewer volatilized chemicals compared to wildfires (Carratt, Flayer, Kossack, & Last, 2017).

There needs to be additional sources of information about prescribed fires that are not currently available or are rarely accessed by the general public, the media, and tourist serving businesses. The technology section above describes the CalTrans CCTV and Wildfire Alert cameras systems, which could provide valuable information about smoke, weather and highway conditions during a fire incident. SNC needs to take an active role in expanding the number of

remote camera sites in the Sierra and the publicizing of these sites in order to provide an alternative site, besides the media, to help visitor decide if they should visit and to help businesses and government take needed actions during a fire incident.

Process

Increasing the consistency of messaging relies on having a single lead originating all safety messaging during a fire. This Incident Command Team (ICT) is led by firefighting agencies. However, it is also important to **embed individuals** from local organizations (e.g., DMO, tourism organization, city supervisors) into the ICT to provide relevant information, help the ICT understand how certain messages might be interpreted, and what additional information would be helpful for the intended audience of individuals and organizations.

ICTs normally provide limited information about a wildfire to the media (e.g., acres burned, structures destroyed, percent contained, number of firefighters). In contrast, ICTs rarely communicate what recreation and tourism opportunities continue to be available or what the current impact of smoke is on these tourism and recreation opportunities. This lack of tourism related information has led the public and the tourism industry to rely on the media for wildfire information. Our results indicated that tourism industry representatives perceived that the media often sensationalize or inaccurately communicate wildfires information and rarely reported any positive post-incident stories about the region. Regional tourism representatives understood that this communications situation was hurting tourism businesses and had no safety benefit.

After the 2017 Detwiler Fire near Yosemite, the National Park Service met with representatives from the Park gateway communities and established a “Gateway Committee.” Before the next fire season the committee worked to build the cooperation of fire fighting agencies to get a non-firefighting agency representative embedded in future ICTs. The goal was to be able to communicate that nearby park and recreation areas would be “open as soon as we can.”

“Getting a tourism representative embedded in the Ferguson Fire ICT resulted in more accurate and timely information, which was relevant for visitors and potential visitors”. Mariposa Focus Group & Interviews

This ICT approach was employed during the 2018 Ferguson Fire near Yosemite. Our focus group and interview results indicated that this led to better coordination of messaging coming from the National Park Service, US Forest Service and gateway communities (e.g., what roads and areas in the park were open and closed). Therefore, the integrated ITC approach is one model that Sierra tourism destinations can employ and SNC can support to develop effective nested communications networks.

In addition to embedding individuals it is recommended that **feedback mechanisms** are developed to provide additional information from organizations and individuals. This can include social media about the event and other opportunities for feedback.

One of the technical challenges that many locales have been considering is how to create a **redundant method to provide messaging to all parties in a timely manner**. This likely starts with a website that provides regularly updated, meaningful information that the intended audiences will uniformly interpret in the intended manner (i.e., two parties don’t disagree about what the message means). However, this online information needs to be coupled with text messages, radio PSAs, electronic billboards, and people reaching out to their customers and neighbors to make sure that they have received this information. Furthermore, the communications needs to consider what happens when any part of this system is not working due to power failure or some other reason.

“So we are asking businesses to be proactive and think about how they can sustain themselves and their businesses without power; do they need generators? A fine

example of this was working with the radio station, which does not have a generator back up and they are the prime way we get information out. Felt they had a robust infrastructure of power – if things are bad on the Nevada side, they switch over to the California side and vice versa... With social media, the problem with that is a lot of the infrastructure in the basin is based around cabling and the telephone system, so if you lose power you lose that tool as well. Radio is really the key for us to communicate things out.” S Lake Tahoe Focus Group & Interviews

“If we the hoteliers have information, if there is power versus no power, then we become an information center and the experts relaying the message to stay. If the power is out that becomes more difficult because we are hypothesizing about the situation at that point. But getting that information on whatever channels make us the boots on the ground experts for our guests.” S Lake Tahoe Focus Group & Interviews

“Kudos for North Lake Tahoe’s program for communication within the Basin. They have remote repeaters for radio that they can broadcast out on their own channel which is just for evacuations and communications. Currently not in the other parts of Lake Tahoe, we rely heavily on the infrastructure of the radio system which is subject to power. Maybe that’s a network we can look to utilize more.” S Lake Tahoe Focus Group & Interviews

In addition to the technical issues of communication during a wildfire event, there are also certain groups of individuals that are relatively more difficult to contact.

“There is no way to directly communicate about smoke conditions with potential day visitors.” Angels Camp Focus Group & Interviews

“We get a few advanced reservations for the winery so we could not contact visitors about the fire.” Angels Camp Focus Group & Interviews

“The challenge for the visitors’ bureau is to be able to contact AirBnB and VRBO users with reservations to tell them about the current conditions. So we kept the visitors centers open.” Angels Camp Focus Group & Interviews

Rather than directly contacting some groups of visitors it might be important to use electronic billboards, signage at grocery and gas stores, or other methods of *encounter* messaging rather than *direct* messaging.

Collect Data for Economic Impact Study

One need that many destinations have is a method of estimating the economic impact of whether to suppress or manage a wildfire. Although the model we developed (Ribaudó & Tierney, 2020) can serve as a foundation for estimating economic impact for this and other purposes, the specificity and effectiveness of such a model will be likely improved by gathering local data during a fire incident, including how practices are evolving over the course of the event.

“When the fire (Ferguson) was burning near Yosemite the Tuolumne River canyon was very smoky. We had to communicate in advance with people who made reservations, told them the situation and offered to give them credit to go on another date. But we did not offer refunds, unless someone complained. From the Tuolumne we lost 3-5% of sales where we could not shift them to another location outside the area.” Angels Camp Focus Group & Interviews

It may also be helpful to gather information about near misses so that the probability of these events occurring can be factored into estimates.

“The Darby fire took out our water supply line. We almost lost the entire golf course.”
Angels Camp Focus Group & Interviews

Post-fire

Goals

After a wildfire event, the primary message should shift from safety to recovery. That recovery should include **recovering the location’s positive destination image**. Moreover, the team should promote opportunities and strategies for post-fire recovery for local residents and businesses.

Content

Marketing to facilitate image recovery needs to happen both for the specific location and more generally pushing back against the assumption that all of the region or the state has burned down. Natural areas may be relatively more sensitive to having their image singed.

“It’s hard to get excited about visiting a blackened death area.” Survey

“The areas in the forest that were burnt by the Rim fire are not visited much anymore.”
Angels Camp Focus Group & Interviews

“Media coverage still gives the impression that Butte County (a year later) is not a safe place to visit, paints it as a danger zone.” Chico Focus Group & Interviews

In contrast, our results suggest that it may be the case that tourists seeking man-made destinations, such as casinos and wineries, are more resilient.

“In two to three weeks (after a fire is out) people are coming up to the wineries.” Angels Camp Focus Group & Interviews

The real concern is that the overall destination image can be negatively impacted rather than the deterioration of an individual attraction.

“It’s one thing to have smoke and lose the beautiful views for a few days but the perception that it is unsafe here is what really hurts bookings – the ripple effect down the road.” Mono and Mammoth Focus Group & Interviews

“The media’s perception is that all the foothills are on fire and it’s too smoky to come, when there are other areas with no impact.” Angels Camp Focus Group & Interviews

The concern is that the media’s focus on sensational reporting, will necessitate that they focus on the flames and smoke and not on the stories of recovery and the unaffected opportunities for recreation and tourism. This can lead to potential visitors forming a more general image that all of the Sierra Nevada region is affected by wildfire rather than specific areas.

“The Rim Fire only truly affected the region two days out of a 4-month period that the fire burned. But we were killed because the media told everyone Yosemite was on fire, and when Yosemite is on fire the public thinks Mammoth Lakes is on fire too due to our association.” Mono and Mammoth Focus Group & Interviews

To counter this negative global image development, regional marketing needs to be accelerated. Our findings show the critically important role Destination Marketing Organizations (DMO), funded by Tourism Improvement District (TBID) receipts, play in post-fire marketing communications. DMOs, with the assistance of other members of nested communication networks (e.g., Visit California) must almost immediately communicate, after a fire, about if and how an area is safely open for business and worth visiting. Visit California and the SNC can aid fire-impacted communities by sending a crisis communications team and by providing some funding for advertising during and after a large wildfire.

“The TBID and Chamber’s top priorities in the future will be to influence the perception of the area as being safe to visit, interesting and scenic. We will need to rally around the TBID.” Chico Focus Group & Interviews

Using photos and video displaying smoke-free vegetated mountain scenes, especially scenes with water and clear skies, may help to nullify negative images of the destination developed during the fire incident due to media reports. Moreover, existing networks of webcams (e.g., highway cameras, Alert Wildlife.org camera system) and other cameras focused on gorgeous scenery can visually represent the continuing tourism opportunities.

In addition to the images, marketing can include stories of recovery. Part of this message should include how tourism adds to the recovery of communities rather than serving as an irritant. Although coming from a good place, if thoughts illustrated by the comments below become common, then Sierra Nevada communities that rely on tourism dollars during the short operational season will be further negatively impacted.

“People need to stay away during wildfire season to allow firefighters to get through far more easily and without worry of evacuation.” Survey

“It seems selfish to go to California with these wildfires. We have postponed vacations to California because of wildfires.” Survey

The impact on recreation businesses is likely to be especially severe. Although hospitality (e.g., restaurants and hotels) may see an increase in revenue during and after a fire event due to purchases by firefighting and recovery professionals, recreations businesses (e.g., rafting, wineries, golf) are most often only negatively affected by fire events (Davis, Moseley, Jakes, & Nielsen-Pincus, 2011; Nielsen-Pincus, Moseley, & Davis, 2011).

“We receive little use/benefit to the winery from fire fighters or recovery workers.” Angels Camp Focus Group & Interviews

“In the last five years wildfires have had a major negative impact on our resort. The impact has lasted for months. People didn’t come up and our golf sales were down 40% in 2018.” Angels Camp Focus Group & Interviews

Study findings showed the amount of local economic stimulus resulting from firefighting and post fire recovery efforts was or was not less than the economic losses for the local tourism industry, depending on the fire and destination characteristics. For example, the post fire spending for the Ferguson fire was very small compared to the large loss in tourist spending, while in the case of the Camp Fire, which had many homes and businesses destroyed, post fire spending was likely much greater than loss in tourist spending. The characteristics of the fire

(described in Appendix B) and the dependence of the community on tourism, greatly influence the balance of recovery spending versus losses in tourism spending and impacts to tourism-serving businesses and local government tax revenue. In addition, during and post fire spending goes primarily to the hospitality segment of the tourism industry, and not to other parts of the industry (e.g. recreation-related companies).

Furthermore, the marketing should include information about how communities are adapting to fire as a natural part of the Sierra Nevada ecosystem. A Mariposa County commissioner described how the public needs to be better informed about the benefits of fire on forest health and how forest management actions now can reduce the number of future severe fires (Long 2019).

“We were able to stop the (Rim) fire in areas of prescribed burns. We need to educate the public about the benefits of fire to the forest and to managing future fires. We have a teachable moment now.” Mariposa Focus Group & Interviews

Our survey (Wilson, 2020) found that most respondents (69%) agreed that wildfire was part of the Sierra Nevada landscape. However, the open ended comments clarified that while they thought fire was a natural part of the region, they perceived that the current fires were often caused by humans rather than being naturally occurring fires.

“Most fires were intentionally started, so better policing of the area is needed.” Survey

“They should be natural wildfires. NOT PG&E caused ‘wildfires!’” Survey

In addition to the marketing campaign, the team should **educate local individuals and business about opportunities to acquire resources to recover** from the previous fire and prepare for the next one. This information should be targeted as much as possible to avoid information fatigue. More about this is in the final section.

Process

In contrast to during the wildfire event when time is of the essence, after the fire there is room to include more perspectives in the message development process. Regional positive destination marketing from DMOs should be reinforced by marketing from individual businesses and state marketing from Visit California. The nested communication networks can provide media outlets with information about current tourism opportunities and stories about recovery. Further, it may be useful to invest in keyword optimization so that the initial listings for searches about the Sierra Nevada region are focused on current opportunities for recreation rather than sensational stories about wildfire events. The nested communication groups can collect information from potential tourists to understand how the current messaging is impacting their image of the Sierra Nevada region as a tourism destination.

Finalize and Communicate Economic Impact Study

Given that most economic analyses of wildfires do not occur until after the event. It makes sense that additional data can and should be collected after the wildfire event. Moreover, there may be some activity that occurs after the flames are out that should be considered as part of the economic impact analysis.

“There has been looting after a fire.” Angels Camp Focus Group & Interviews

After collecting all essential data, the economic impact model that was developed can be applied to a fire incident. This could better quantify the full extent of financial damage that was done by the fire, beyond the number of structures destroyed and injured persons that is normally

all that is available. Model results can also assist businesses and government agencies to assist securing grants, and communicating the impact to insurance companies, politicians, and the general public. As a database of figures from different communities and different wildfires is developed, comparisons can lead to further refinement of the economic impact model.

Enhance Technology to Collect and Distribute Tourism-related Fire Information

More web-based information about wildfire activity and ambient conditions at tourism destinations is needed and should be available to the public. There is information about fires found on firefighting agency websites and available to the public, such as CAL FIRE (www.fire.ca.gov), but this study identified that such information is often limited. Not enough key information needed by travelers and tourist serving businesses is available. For example, “What is the visibility in Yosemite Valley?” Firefighting agency websites may be difficult to interpret (e.g., inciweb.nwcg.gov). Valuable information for tourism is often spread between several websites. It would be beneficial to have one or two highly publicized websites with comprehensive information for tourism-related organizations and visitors.

One powerful source of information is video. There are currently at least two camera systems that provide updated images of ambient conditions in the Sierra. These remote cameras could be valuable for tourism to show smoke, weather, and highway traffic conditions in and around tourist destinations during a fire incident. CalTrans has a closed circuit television system (CCTV) with cameras on many roads in the state (<http://cwwp2.dot.ca.gov/vm/iframe.htm>), including the Sierra region. But their primary purpose is to show traffic conditions and many cameras only show the road surface and not outside conditions. Plans call for expanding the number of camera locations (<https://dot.ca.gov/caltrans-near-me/district-2/d2-popular-links/d2-traffic-camera-faq>), but at present, most cameras are in urban areas. A second camera system is the Alert Wildfire network (www.alertwildfire.org/). It provides access to state-of-the-art Pan-Tilt-Zoom fire cameras to help firefighters and first responders confirm fire ignition location and monitor fire behavior. There are over 100 cameras statewide, including many in the Sierra. They generally show distant views, ideal for assessing smoke conditions. But the system is not well known to the public or media.

It is recommended that SNC should support the expansion of CalTrans CCTV locations showing ambient conditions at more tourist destinations and highways in the Sierra. Another opportunity is to help publicize current information, especially the Alert Wildfire network

Forest Health

Are forest management techniques supported?

An important question is how supportive of forest management techniques to reduce the risk of fire and its impacts (including to tourism) are residents and visitors to the Sierra Nevada region. See the detailed survey report (Wilson, 2020), or Appendix B for a brief summary of responses to survey questions about impacts of fire on visitor travel to the Sierra and on support for forest management. There was strong support for forest management. Most resident respondents supported funding for forest management to reduce fire risks and impacts (82%); increased funding for more firefighters and infrastructure in the area (81%); controlled burns and limitations on development in fire prone areas (80%); clear cut areas of forest that have burned to prepare for reforestation (78%); and clear cut or thinning of trees around Sierra towns and

roads (77%). Regional electricity blackouts received the lowest level of support (60%). These data suggest there is overall strong support for forest management and firefighting to reduce fire risks and impacts, but less for regional blackouts.

Linkages between forest management, wildfire, and tourism

The research completed in this project and the findings in other published studies support the notion that Sierra Nevada tourism is linked to forest health. A model of the connections between forest management, tourism and wildfire was developed and is presented in Appendix B. The model posits there is a direct relationship between appropriate forest management, wildfire and tourist interest and tourist visitation to a Sierra Nevada. Testing of this model is needed to calibrate the relationships described. But there is ample evidence from this focus group and survey results to support the basic premise that forest health is related to forest management, reductions in very large destructive fires and healthy tourism. Therefore, tourism is an additional justification for protecting natural resources and appropriate forest management actions in the Sierra Nevada (see Appendix B).

Reducing large wildfire occurrence through appropriate forest management promotes healthy tourism, which in turn supports local tourism dependent communities, and it aligns with the California Forest Carbon Plan (2018) to reduce carbon emissions and achieve climate goals.

“Decades of fire exclusion, coupled with drought and the stressors associated with climate warming, have reduced forest health and dramatically increased the size and intensity of wildfires and bark beetle infestations and have exposed millions of urban and rural residents to unhealthy smoke-laden air. These conditions threaten progress toward meeting the state’s long-term climate goals.” (California Natural Resources Agency, 2018)

Funds for forest management

A key action to be able to test the forest management-tourism model and increase forest management in the Sierra Nevada is finding new sources of funding. We urge stakeholders to seek funding from new and nontraditional sources. There is greater impetus now to do more to restore forests so they are more resilient and are reliable long-term carbon sinks, rather than a greenhouse gas and black carbon emission sources (due to catastrophic fires - which also hurts regional tourism). Appendix B describes the connection and opportunities between Sierra Nevada tourism, forest health, forest management and wildfire.

A large potential source of funds is directly and indirectly related to 2018 California Forest Carbon Plan (California Natural Resources Agency, 2018). This document outlines how carbon credits can be earned from forest management projects with long term, verifiable carbon sequestration. Many organizations are interested in supporting forest management in order to: 1) Help the state achieve the carbon plan goals; 2) seek to green their organization actions and image for employees and clients; and/or 3) need to purchase carbon credits to expand their business operations. Examples of these organizations can range from Facebook and Cemex, to the California Public Employees Retirement System. California ski resorts have a vested interest in promoting forest health to enhance or maintain their winter and summer tourism products, clientele and mitigate global warming. Perhaps even a dedicated forest management tax may be feasible.

Developing Financial Support

Increased funding for firefighters, firefighting infrastructure, and forest management all received high levels of support from participants in the focus groups, interviews, and survey respondents (Wilson, 2020). Nearly all (92%) of Sierra Nevada residents indicated that they support more funding for “firefighters and firefighting infrastructure.” However, it is unclear

whether they assumed these resources would come from local taxes, state funds, or relief from the federal government.

Grant application and administration

Pre-fire: Preparedness

Many communities in the Sierra have extremely limited funds to plan for fire emergencies and to assist local businesses and nonprofits plan for and support fuel management and resilient forest health activities on private lands.

“Provide funding sources for rural communities to develop alternative means of protecting themselves from fire. Rural areas are more susceptible to fire and have fewer resources.” Angels Camp Focus Group & Interviews

Sierra communities often do not own or manage lands surrounding them. Consequently, the nested communication collaborations and economic impact model findings can further support the development of grant applications and messaging to influence public and private land managers and other government agencies. This process can be facilitated by hiring a set of grant writers and administrators at a regional level that can focus on supporting fire affected communities.

“If the funds do dry up. I mean, we're really going to be reliant on the drawing on foundation moneys and other things to help us along in recovery.” Chico Focus Group & Interviews

Some possible sources of funds for making forest more resilient and wildfire mitigation include regional funding such as FIRE’s California Climate Investments (CCI) Fire Prevention grant program. This program provides wildfire prevention funding in three areas that cover many of the previously outlined activities; hazardous fuel reduction, fire prevention education, and fire prevention planning (CAL FIRE, 2020). The SNC Forest Health Grant Program (FHG) and the Vibrant Recreation and Tourism Grant program (VRTG), have been and could continue be used to assist destinations plan for and recover from wildfires. There are also more local examples of funding that can be encouraged and supported.

“The City (of Angels Camp) has a fund pool and grant program to purchase generators.” Angels Camp Interviews and Focus Group

Post-fire: Recovery

After a fire, communities may need resources to rebuild and recover their image as an attractive destination for tourism. This should occur as soon after the wildfire event as possible in order to capitalize on media attention. As described previously, DMOs will need to be the central coordinator and distributor of post-fire tourism marketing communications. There will need to be almost immediate communicate that the area is open for business, safe and worth visiting by providing some funding for advertising during and after a large wildfire.

“The Explore Butte County (local DMO) and Chamber’s top priorities in the future will be to influence the perception of the area as being safe to visit, interesting and scenic. We will need to rally around the TBID and Explore Butte County.” Chico Focus Group & Interviews

Communities may have the opportunity to redevelop some tourist attractions to be even better than before the wildfire (e.g., build off of existing isolated trails to create an interconnected trail system with strong signage). Creating new multi-purpose infrastructure which serves both fire protection/safety goals and enhances the attractiveness of the destination for tourist seems to be the wave of the future. An example of this are new fuel breaks around a community that serve as evacuation routes and reduces fire severity, which as could be a trail system which is a tourist attraction. Another example of this come from Calaveras County which converted fire lines built by bulldozers into recreational trails.

“Paradise is re-visioning its roads and trails, one of the things that we have discussed prior to the fire are multiuse pathways that could be trails and resident evacuation routes or could be used by emergency vehicles during evacuations. Also the idea of trails as fire breaks around the community.” Chico Focus Group & Interviews

Even the best prepared tourist destinations in the Sierra will likely need assistance to recover after a devastating fire. Funding examples include the 2019 \$21 billion fund created through electricity surcharges to electricity production or transmission (Nikolewski, 2019). Resources to recover from wildfire also include the California Community Foundation’s Wildfire Relief Fund (California Community Foundation, 2020), California Fire Foundation (2020) and SNC’s Forest Health Grant Program (FHG) and the Vibrant Recreation and Tourism Grant program (VRTG). The VRTB recognizes that “if the size and scope of severe fire and tree mortality continue to grow due to climate change and drought, these (unique Sierra tourism) resources and economic contributors may disappear and take centuries, if ever, to return.” Sierra communities should take more advantage of these program before the fire season and utilize information from this research to help them apply for the grants. The SNC should consider making these grants available for tourism destination to recover, not just physical and forest recovery, but also for tourism infrastructure and even tourism marketing.

Encourage More Firefighting and Recovery Spending Staying Local

There are large sums of money spent by CAL FIRE and the U.S. Forest Service on outside contractors to help fight wildfires, support firefighters, and in the recovery process. If more of these contracts and spending was awarded to vendors located in the area impacted by the fire, it would help offset adverse economic impacts caused by disruptions in tourism. Focus group respondents who were employed by CAL FIRE indicated they are sympathetic and try to do this already, but more can be done.

Prior to the fire season, local government officials and business owners in fire prone areas, such as Mariposa, Sutter, Calaveras and Amador Counties, could meet with locally based firefighters and see what services are usually contracted out during a moderate to large fire. Preferred provider relationships and rates could be established. Entrepreneurs could develop new services and products or convert/prepare their existing ones to meet firefighting and recovery needs. Staff could be cross-trained in advance of the fire season.

Insurance

Efforts need to be made to help tourism businesses in Sierra Nevada communities acquire insurance or they may not be able to continue operating in the area. Because many Sierra communities are located in fire prone areas, fire insurance rates have gone up rapidly and some businesses have had their coverage dropped. There are worries that insurance cost and cancelation problems will hamper a destination’s ability to recover from a fire.

“87% of businesses that are damaged by fire go bankrupt, often because of inadequate insurance.” Angels Camp Focus Group & Interviews

“Our insurance has doubled in the last three years.” Angels Camp Focus Group & Interviews

“My fire insurance coverage for the winery went up 400% this year.” Angels Camp Focus Group & Interviews

Currently, if a business cannot find fire coverage, they can go to the California FAIR Plan. The FAIR Plan, created by the California Legislature in 1966, offers bare-bones coverage that doesn't include theft or liability insurance. But the FAIR Plan is considered a very expensive fire policy to begin with, and after a business adds additional coverage for wind, hail, falling objects, water damage, theft, freezing, medical payments and liability, it may be prohibitive. Similarly, focus group respondents indicated that reduced tourist traffic, due to a distant fire, may not be covered by business interruption insurance. Moreover, the rates for business interruption insurance are often prohibitive for small tourism businesses. The nested communication networks should communicate with politicians to influence the further development of the FAIR plan and other insurance options, such as business interruption insurance.

Influence Rules about Working in Smoky Conditions

Important regulations that impacts tourist-serving businesses are those that constrict how and when people can working during smoky conditions caused by wildfires. Currently, OSHA regulations about wildfires are being actively debated (e.g., Layton, 2020). One area that organizations need to consider is how to adapt work assignments in the case of smoke from wildfires. Of particular concern are employees, other than firefighters, that must do their job outside (e.g., rafting guides).

“I am very concerned about what Cal/OSHA will do. They have proposed regulations on staff working in smoky conditions (caused by wildfire). If our guides can't work when it is smoky it will mean more cancellations in our short summer season, make scheduling trips difficult, we'll still have to pay our guides and this would be a big hit on our finances.” Angels Camp Focus Group & Interviews

One of the tasks that the communication networks can accomplish before fires occur is to influence the process by which Cal/OSHA develops guidelines and regulations for employees working when there is smoke in the area. It may be useful for Cal/OSHA to hear from the multiple perspectives about what is useful and practical for both organizations and employees.

Future Research

There are six suggestions below for future research that were identified in the study.

1. Create a “Best Practices and Resources Guide” for Communities
2. Develop fire tourism- workshops
3. Calculate economic impact of all 2018 wildfires on entire Sierra Nevada region
4. Support the creation of a California Center for Fire and Tourism
5. Conduct a study which tests the linkages between forest health and tourism.
6. Investigate if individuals become more sensitive to wildfire effects in the region as the date of their trip approaches.

Synopsis

The Sierra Nevada region has been attracting visitors year around from all parts of the globe and has three of the top ten tourist attractions in the state. Sierra Nevada ski areas host world-wide visitors and three are among the top ten winter resorts in the USA. For state residents, the region is so important it is referred to as their “mountain playground.” The vast majority of Sierra Nevada tourism is dependent on outdoor recreation and natural resources, which require healthy forests, streams and scenic vistas. But these very resources are increasingly threatened by wildfire.

How much longer will tourism in the Sierra Nevada remain viable? Furthermore, how will the loss of tourism to this region with some of California’s top attractions affect tourism in all of California? Visit California CEO Caroline Betta stated that Napa bounced back within two months after the 2018 wildfire (Poimiroo, 2019). Our research suggests impacts on tourism can be large and some long term. However, the cumulative effect of an increasing number of significant wildfires may lead to an overall negative destination image that the Sierra Nevada, and California are burning. One author went so far as to say wildfires in the state pose an “existential” threat to California tourism. Former Governor Jerry Brown stated in 2017, “We have a real challenge here (from wildfire), threatening our whole way of life” (Poimiroo, 2019). Governor Newsom similarly stated about wildfires, “The unprecedented scale of the crisis requires an unprecedented response” (Office of the Governor, 2020).

The 15 reports that make up this study document the impacts of wildfire on Sierra Nevada tourism; the visitors, tourist-serving businesses, its communities, and governments. Recommendations were developed based on data gathered from a review of previous research, focus groups, surveys of national and state residents, and an economic impact analysis. These recommendations are focused on helping the region minimize adverse impacts from wildfire on tourism. Recommendations are organized into the stages of pre, during and post-fire and include strategies for communications, education and training, resource development, and financial assistance.

Three things are certain; tourism is critical to the economy of the Sierra region; wildfire can have significant adverse impacts on its economy and natural resources; and large wildfire occurrence will increase in the future without some type of forest management and with increasing climate change. Now is the time for the Sierra Nevada Conservancy, government agencies, regional organizations, local communities, tourist-serving businesses, and residents to act to mitigate future wildfire impacts and restore forests, streams, and natural resources to healthy conditions. Otherwise, travelers and their many economic benefits may go elsewhere.

References

- Alexander, K. (March 25, 2020). *How the coronavirus pandemic is crippling California's efforts to prevent catastrophic wildfires*. San Francisco Chronicle. <https://www.sfchronicle.com/environment/article/Coronavirus-hobbles-California-s-effort-to-15154894.php>
- Alexander, K. (April 1, 2020). *California's winter goes down as one of the driest, thin snowpack shows*. San Francisco Chronicle. <https://www.sfchronicle.com/environment/article/California-s-winter-goes-down-as-one-of-the-15172881.php>
- Alphonso III, F. (October 30, 2019). *California congressman calls on the state to take over PG&E*. CNN. <https://www.cnn.com/us/live-news/california-fires-10-30-2019/index.html>
- Attractions of America. (2020). *California top 20 attractions*. <https://www.attractionsofamerica.com/attractions/california.php>
- Burrell, J. (2017). *Top Ten: California's most popular attractions*. San Jose Mercury News. <https://www.mercurynews.com/2017/10/30/top-10-californias-most-popular-attractions/>
- CAL FIRE (2020). *Fire prevention grants program*. <https://www.fire.ca.gov/grants/fire-prevention-grants/>
- California Community Foundation (2020) *Wildfire Relief Fund*. <https://www.calfund.org/wildfire-relief-fund/>
- California Department of Forestry & Fire Protection. (2019a). *Top 20 Largest California Wildfires*. https://www.fire.ca.gov/media/5510/top20_acres.pdf
- California Department of Forestry & Fire Protection. (2019b). *Top 20 Most Destructive California Wildfires*. https://www.fire.ca.gov/media/5511/top20_destruction.pdf
- California Natural Resources Agency (2018). *California Forest Carbon Plan; Managing Our Forest Landscapes in a Changing Climate*. <https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2018/05/California-Forest-Carbon-Plan-Final-Draft-for-Public-Release-May-2018.pdf>
- California Fire Foundation (2020). <https://www.cafirefoundation.org/>
- Carratt, S. A., Flayer, C. H., Kossack, M. E., & Last, J. A. (2017). Pesticides, wildfire suppression chemicals, and California wildfires: A human health perspective. *Current Topics in Toxicology*, 13.
- Cisneros, R., Alcala, E., Schweizer, D., & Burke, N. (2018). Smoke complaints caused by wildland fire in the southern Sierra Nevada region, California. *International Journal of Wildland Fire*, 27(10), 677-683.
- Davis, E. J., Moseley, C., Jakes, P. J., & Nielsen-Pincus, M. (2011). The lost summer: Community experiences of large wildfires in Trinity County, California.
- Dean Runyan Associates Inc. (April 2020). *California Travel Impacts: 2010-2019* (pp. 155). Portland, OR: Visit California
- Goss, M., Swain, D. L., Abatzoglou, J. T., Sarhadi, A.Kolden, C., Williams, A. P., & Diffenbaugh, N. S. (2020). *Climate change is increasing the risk of extreme autumn wildfire conditions across California*. Environmental Research Letters. <https://iopscience.iop.org/article/10.1088/1748-9326/ab83a7>
- Hamilton, M., Fischer, A. P., & Ager, A. (2019). A social-ecological network approach for understanding wildfire risk governance. *Global Environmental Change*, 54, 113-123. doi: <https://doi.org/10.1016/j.gloenvcha.2018.11.007>
- Kim, M.-K., & Jakus, P. M. (2019). Wildfire, national park visitation, and changes in regional economic activity. *Journal of Outdoor Recreation and Tourism*, 26, 34-42.
- Kent, B., Gebert, K., McCaffrey, S., Martin, W., Calkin, D., Schuster, E., . . . Ekarius, C. (2003). *Social and economic issues of the Hayman Fire*. (RMRS-GTR-114). Ogden, UT.
- Law, L. (2020). 14 top rated tourist attractions in California. <https://www.planetware.com/tourist-attractions/california-usca.htm>

- Layton, Keenan (2020) Proposed federal OSHA standards for wildfire smoke. *Seattle Journal of Technology, Environmental & Innovation Law*, 10(1)
<https://digitalcommons.law.seattleu.edu/sjteil/vol10/iss1/5>
- National Park Service (2020a). *Wildland fire: What is a prescribed fire?*
<https://www.nps.gov/articles/what-is-a-prescribed-fire.htm>
- National Park Service (2020b). 2019 Visitation statistics, Yosemite National Park
<https://irma.nps.gov/STATS/Reports/Park/YOSE>
- National Park Service (2009). Yosemite National Park VSP Visitor Study.
<https://www.nps.gov/yose/learn/nature/upload/Visitor-Use-Summer-2009-Study.pdf>
- National Science Foundation (2018). Sierra Nevada study: Forest thinning can prevent wildfires, preserve water. https://www.nsf.gov/news/news_summ.jsp?org=NSF&cntn_id=245128
- Nielsen-Pincus, M., Moseley, C., & Davis, E. J. (2011). Fire suppression costs and impacts of the 2008 wildfires in Trinity County, California.
- Nikolewski, R. (October 24, 2019). Assembly Bill 1054 creates a \$21 billion fund for fires caused by utility equipment. *The San Diego Union-Tribune*
<https://www.sandiegouniontribune.com/business/energy-green/story/2019-10-24/california-regulators-approve-funding-for-controversial-wildfire-law>
- Office of the Governor (January 29, 2020). Governor Newsom announces completion of emergency projects to protect wildfire vulnerable communities.
<https://www.gov.ca.gov/2020/01/29/governor-newsom-announces-completion-of-emergency-projects-to-protect-wildfire-vulnerable-communities/>
- Palmer, J. F., & English, D. B. K. (2019). An index of viewer sensitivity to scenery while engaged in recreation activities on U.S. National Forests. *Landscape and Urban Planning*, 189, 91-98. doi: <https://doi.org/10.1016/j.landurbplan.2019.03.006>
- PG&E (2020). *What is a public safety power shutoff?*
https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/public-safety-power-shutoff-faq.page
- Poimiroo, J. (January 12, 2019). Why wildfires pose an existential threat to California tourism. *San Francisco Chronicle*. <https://www.sfchronicle.com/travel/article/Why-wildfires-pose-an-existential-threat-to-13524917.php>
- Prudencio, L., Choi, R., Esplin, E., Ge, M., Gillard, N., Haight, J., . . . Flint, C. (2018). The Impacts of wildfire characteristics and employment on the adaptive management strategies in the Intermountain West. *Fire*, 1(3), 46.
- Ribaldo, C. (March, 2020). South Lake Tahoe: Focus group and interview report (pp. 20) Auburn, CA: Sierra Nevada Conservancy.
- Ribaldo, C. (March, 2020). Lake Tahoe case study: Wildfire impacts report (pp. 9) Auburn, CA: Sierra Nevada Conservancy.
- Ribaldo, C. (March, 2020). Mammoth Lakes/Mono County case study: Wildfire impacts report (pp. 7) Auburn, CA: Sierra Nevada Conservancy.
- Ribaldo, C. (March, 2020). Mono County and Mammoth Lake: Focus group and interview report (pp. 15) Auburn, CA: Sierra Nevada Conservancy.
- Ribaldo, C. & Tierney, P. (2020). Economic Impact of Wildfire on the Sierra Nevada Report. Auburn, CA: Sierra Nevada Conservancy.
- Robie, M. (2019). Visitors from abroad power California's biggest export.
<https://travelmattersca.com/travel-hub/visitors-power-californiasexport#:~:text=to%20travel%20hub:text=to%20travel%20hub,Visitors%20from%20abroad%20power%20California's,By%20Maurice%20Robie%20%7C%205%20min.&text=International%20visitor%20spending%20accounts%20for,some%201.2%20million%20tourism%20jobs.>
- Sierra Forest Legacy (2020). *Forest Economics*. https://www.sierraforestlegacy.org/FC_FireForestEcology/FFE_ForestEconomics.php.

- Sierra Nevada Conservancy (2014). The state of the Sierra Nevada's Forests. https://sierranevada.ca.gov/wp-content/uploads/sites/326/2019/12/StateOfSierraForestsRpt_a11y.pdf
- Sierra Nevada Conservancy. (2020). *About us*. <https://sierranevada.ca.gov/about-us/>
- Syphard, A. D., & Keeley, J. E. (2019). Factors associated with structure loss in the 2013–2018 California wildfires. *Fire*, 2(3), 49.
- Tierney, P. (2012). Final results: Economic Impact of California Ski Resort Operations. Presentation to Ski Lake Tahoe, Nov. 26, 2012.
- Tierney, P. (January, 2019). Chico focus group and interview report. Auburn, CA: Sierra Nevada Conservancy.
- Tierney, P. (January, 2019). Mariposa focus group and interview report. Auburn, CA: Sierra Nevada Conservancy.
- Tierney, P. (January, 2020). Angels camp focus group and interview report (pp. 15) Auburn, CA: Sierra Nevada Conservancy.
- Tierney, P. (February, 2020). Butte County case study: Wildfire impacts report (pp. 7) Auburn, CA: Sierra Nevada Conservancy.
- Tierney, P. (March, 2020). Mariposa County case study: Wildfire impacts report (pp. 11) Auburn, CA: Sierra Nevada Conservancy.
- Tierney, P. (March, 2020). Sutter Creek focus group and interview report. Auburn, CA: Sierra Nevada Conservancy.
- Tierney, P. & Ribaudó, C. (2020). Economic Impact of Wildfire on Tourism in the Sierra Nevada. Auburn, CA: Sierra Nevada Conservancy.
- Touropia (2019). Best places to visit in California. <https://www.touropia.com/best-places-to-visit-in-california/>
- Travel and Leisure (2013). America's most visited ski resorts. <https://www.travelandleisure.com/hotels-resorts/mountain-ski-resorts/americas-most-visited-ski-resorts?slide=2103766#2103766>
- Traynor, A. (2020). Ten most popular US ski resorts ranked by skier visits. *Snowbrain.com*. <https://snowbrains.com/top-10-most-popular-us-ski-resorts/>
- US Forest Service (2015). The rising cost of fire operations: Effects on the Forest Service's nonfire work. <https://www.fs.usda.gov/sites/default/files/2015-Fire-Budget-Report.pdf>
- US Forest Service (2017). National Visitor Use Monitoring Program. <https://apps.fs.usda.gov/nvum/results/>.
- US Forest Service (2020a). Co-Management of Fire Risk Transmission (CoMFRT). <https://www.fs.usda.gov/rmrs/groups/comftr>
- US Forest Service (2020b). People working in fire. <https://www.fs.usda.gov/science-technology/fire/people>
- US News and World Report (2019). Best places to visit in California. <https://travel.usnews.com/rankings/best-places-to-visit-in-california/>
- Williams, A. P., Abatzoglou, J. T., Gershunov, A., Guzman-Morales, J., Bishop, D. A., Balch, J. K., & Lettenmaier, D. P. (2019). Observed impacts of anthropogenic climate change on wildfire in California. *Earth's Future*, 7, 892-910. doi: 10.1029/2019EF001210
- Wilson, J. (March, 2020). Impact of wildfire on tourism in the Sierra Nevada region: Survey of resident and nonresident experiences and attitudes (pp. 119) Auburn, CA: Sierra Nevada Conservancy.
- Wilson, J. (September, 2019). Impact of wildfire on tourism in the Sierra Nevada region: Fire & tourism literature review (pp. 11) Auburn, CA: Sierra Nevada Conservancy.
- Wright, C. (November 5, 2019). *Fact-checking Trump's tweets on the California fires*. Outside. <https://www.outsideonline.com/2404949/fact-check-trump-wildfire-tweets-2019>
- Zajchowski, C. A. B., Brownlee, M. T. J., & Rose, J. (2018). Air quality and the visitor experience in parks and protected areas. *Tourism Geographies*, 1-22. doi: 10.1080/14616688.2018.1522546

Appendix A. Summary of Survey Results on Tourism and Wildfire Connections

This appendix presents a summary of the condensed results from select questions in the survey of California residents (excluding residents of the study area) and nonresidents related to just their attitudes and behaviors about visitation and wildfire in the Sierra Nevada region. A complete detailed description of the methodology and presentation of all survey findings are found in the study's survey report (Wilson, 2020). The survey asked respondents to only consider leisure travel in the summer and fall for a five year period (2014-2019). A total of 626 residents of California and 634 nonresidents completed the surveys. The purpose of this summary is to focus just on visitation to the region and how fire impacted tourist attitudes and behaviors concerning visiting the region.

Summary of Key Sierra Nevada Tourist Visitation Statistics

The Sierra Nevada region draws visitors from around the world and is particularly important to California tourism. The region is also considered the "mountain playground" for many residents of California. The following data is an expansion compared to the introduction and illustrates key statistics and relationships for Sierra Nevada tourist visitation.

- Three of the top ten tourist attractions in the state are found in the Sierras; Yosemite National Park, Lake Tahoe and Kings Canyon/Sequoia National Park (Burrell, 2017; Law, 2020). There is no state-wide data on this topic but these and other sources all include Yosemite and Tahoe in the top ten destinations.
- The Sierras are a strong draw from nonresident visitors to the state. Economically, this is key because nonresident tourists on average stay longer and spend more on a trip than do locals, who more often take day trips (Robie, 2019; US Forest Service, 2017). International visitor spending in the state currently provides a positive balance of trade with California residents spending outside the U.S. (Robie, 2019).
- Yosemite is considered the state's most important must-see attraction for international visitors, exceeding Disneyland, San Francisco's Golden Gate Bridge, or the San Diego Zoo in popularity (Attractions of America, 2020). Again, there is no state-wide data on this topic, but the source above and others show Yosemite as the top destination (Touropia, 2019; U.S. News and World Report, 2019).
- Of the 4.4 million visitors to Yosemite National Park in 2019, about 25%, or 1.1 million, reside outside the USA (National Park Service 2020b & 2009). This provides a minimum estimate of how many international visitors come to the region during spring, summer and fall. These data is the most recent available for Yosemite, Only 1.1% of 2017 Eldorado National Forest summer visitors were international (US Forest Service, 2017)
- During the winter, the Sierra Nevada's ski resorts host visitors from around the globe and three Sierra Nevada resorts: Mammoth, Heavenly and North Star; ranked by skier volume, are consistently among the top ten most visited winter resorts in the USA (Travel and Leisure, 2013; Traynor, 2020).
- In a state-wide analysis of the 2010-11 season 83% of all skier visits in California went to resorts located in the Sierra Nevada. Over 73% of full time ski employees were from resorts in the Sierra Nevada (Tierney, 2012).
- There were over 22.8 million visits made in 2012 to the nine national forests found in the Sierra Nevada region, with 16.5% overnight and wilderness area visits and 83.5% day and general forest visits (National Forest Service, 2017). In the Eldorado National Forest 52%, or 11.8 million visits, were made by California residents who

resided outside the region, 28% were made by regional residents, 2.5% by non-California residents from the USA and 1% were international visitors.

- In California during 2019, tourism generated \$144.9 billion in travel spending, \$12.2 billion in state and local taxes, and created over 1.2 million. This was a 4.7% increase over 2018. Annual Travel earnings increased an average of 6.9% since 2010. During this same time, tourism in the Sierra Nevada region generated \$3.6 billion in travel spending. The High Sierra region had 36,400 travel related jobs in 2019 (Dean Runyan Associates Inc., 2020).
- Tourism makes up a larger portion of economic activity in the 22 California counties that are part of the Sierra Nevada region compared to California as a whole. The average percentage of visitor-generated taxable sales versus total taxable sales for the 22 counties in 2018 (14.7%) was more than twice as high as overall for the state (7.0%, Dean Runyan Associates Inc., 2020). Tourism is the economic life blood of the region, especially in smaller rural counties and communities in this region.

Survey of Results on Attitudes and Behaviors about Visitation

Over 86% of the California resident survey respondents were extremely, moderately or slightly likely (subsequently referred to as “likely”) to recommend someone visit the Sierra Nevada on a leisure trip (Table 1; Wilson, 2020). Data indicate a relatively positive destination image of the region. This is important because California residents make up the majority of Sierra Nevada tourists.

Table 1. How likely would you recommend someone to come to the Sierra Nevada region of California for recreation or leisure travel during summer or fall 2020? (Residents)

	#	%
Extremely likely	298	47%
Moderately likely	185	29%
Slightly likely	64	10%
Neither likely nor unlikely	69	11%
Slightly unlikely	9	1%
Moderately unlikely	6	1%
Extremely unlikely	8	1%
Total	639	

Nonresidents were asked if they considered or actually traveled to the Sierra Nevada region, and 28% had (Table 2). This suggests the majority of nonresident survey respondents have not visited the region recently. The vast majority (78%) of these visits were for leisure purposes.

Table 2. Have you considered or have you actually traveled to the Sierra Nevada region of California during the summer or fall since 2014? (Nonresidents)

	#	%
Yes	176	28%
No	458	72%
Total	634	

Nonresident survey respondents recorded an average of 1.7 day trips and 2.9 overnight visits during the period (Table 3).

Table 3. Average Number of Day and Overnight trips to the Sierra Nevada region. (Nonresidents who did visit)

	Day Trips	Overnight Trips
Average # Trips	1.7	2.9

The majority of activities nonresidents undertook while visiting the Sierra Nevada region relied on natural resources and scenic vistas (Table 4). These activities included scenic driving (68%); outdoor recreation like day hiking and backpacking (48%), nature photography (39%), river rafting/kayaking (8%) and fishing/hunting (7%). There also was a diversity of other types of activities, like visiting historic site (33%), visiting agricultural sites (13%); an attending festival or event (13%) which were not directly related to natural resources.

Table 4. What activities did you do during your most recent trip to the Sierra Nevada region of California? Choose all that apply (Nonresidents)

	#	%
Scenic driving	97	68%
Day hiking/backpacking	68	48%
Nature photography	55	39%
Visited historical sites	47	33%
Visited agricultural sites	18	13%
Attended festival or event	18	13%
River rafting/Kayaking	11	8%
Bicycling	11	8%
Fishing/Hunting	10	7%
Other	10	7%

The average amount of nonresident spending per group per day for their most recent visit to the Sierra Nevada region was \$912 (Table 5). Lodging was the largest expenditure category (\$308).

Table 5. Average Nonresident Expenditure by Category

Lodging Accommodations	\$308
Transportation	\$196
Food	\$150
Recreation	\$109
Retail	\$105
Other	\$44
Total Average Spending Per Group Per Day	\$912

Awareness and Effects of Wildfire on Visitation

The vast majority of resident respondents (84%) were aware of wildfires in the Sierra Nevada region. Only 8% of residents were unaware. This suggests persons living in California have a very high level of cognizance of wildfire occurrence in the study area.

Table 6. How aware are you of wildfires in the Sierra Nevada region of California since October 2014? (Residents)

	#	%
Very aware	240	38%
Aware	179	29%
Somewhat aware	106	17%
Neither aware nor not aware	57	9%
Somewhat unaware	22	4%
Unaware	19	3%
Strongly unaware	5	1%
Total	628	

The survey asked residents about what they believe the impact of wildfires has been in the Sierra Nevada region. Table 7 shows that residents understood fires have had a mostly negative impact on natural scenery, tourist serving businesses, local forest health and outdoor recreation opportunities. Over a third of respondents (35%) felt fire was good for forest health, the highest percentage of any positive result. Findings suggest residents perceive the impact of wildfire on the region as mixed, but with bad impacts out-weighting good impacts.

Table 7. What do you believe the impact of wildfires has been in the Sierra Nevada region? Percent indicating impact for good and percent agreeing it was bad. (Residents)

	Good	Neither	Bad
Local natural scenery	32%	19%	49%
Businesses that serve tourists	32%	21%	47%
Local forest health	35%	20%	45%
Local outdoor recreation opportunities	33%	24%	43%
Local government	32%	29%	39%
Other members of your community	32%	33%	35%

Over half (53%) of California resident survey respondents who would recommend a visit to the Sierra Nevada region, indicated they did consider the potential for wildfires in their recommendation for others to visit. This suggests there is a great deal of concern among residents about the impact of wildfires on tourism to the region.

Table 8. Did the potential for wildfires in the area impact your recommendation (for others to visit the Sierra Nevada region)? (Residents)

	#	%
Definitely yes	146	23%
Probably yes	117	19%
Maybe yes	69	11%
Might or might not	77	12%
Maybe no	33	5%
Probably no	75	12%
Definitely no	115	18%
Total	632	

The survey asked nonresidents how they or their group got information about wildfires and associated conditions in the Sierra Nevada region. The table below shows that television/radio/newspapers, the internet and social media, and a park or forest agency were the most common sources of fire related information. Only 8% received it from a local visitors' bureau or business.

Table 9. How did you or your group get information about wildfires and associated conditions in the Sierra? (Nonresidents)

	#	%
Television/Radio/Newspaper	17	44%
Internet/Social media	16	41%
Park or forest service agency	12	31%
Past experience	10	26%
Word of mouth	10	26%
No information	5	13%
Local business or visitors' bureau in region	3	8%
Other	2	5%
CAL FIRE	1	3%
Respondents	39	

Nonresident survey respondents were asked if the potential for or actual occurrence of wildfires impacted their decision to (not) travel to the Sierra Nevada region. Only 22% of nonresidents indicated it did, while 78% stated wildfire did not impact their travel decision to the Sierra Nevada region. This impact may at first seem small, but is not trivial when you consider that a 22% decline in the 4.4 million annual visitors to Yosemite National Park could result in a loss of 968,000 lost in visitors. So even though the percent whose trip was impacted may seem small, the number people impacted and economic fallout can be very large. In fact, the economic impact of wildfire on tourism report, projected a \$45 million loss in direct and indirect expenditures in Mariposa County from the 2018 Ferguson fire (Tierney & Ribaudó, 2020).

Table 10. Did the potential for or actual occurrence of wildfires impacted your decision to (not) travel to the Sierra Nevada region? (Nonresidents)

	#	%
Yes	39	22%
No	136	78%
Total	175	

When nonresidents who visited were asked how have wildfires (e.g., flames, smoke, blackened scenery, loss of infrastructure) impacted their summer or fall travels to the Sierra Nevada region of California since 2014 (Table 11). About 35% changed their travel destination to another Sierra location, 30% had people in their group cancel, 27% cancelled their trip outright, 19% left the region early, 14% changed accommodations to avoid smoke and 5% changed activities. Smoke was a commonly indicated impact. The data suggest most nonresidents considering a visit to the Sierra Nevada region changed where and how long they stayed due to wildfire, but still about one in four cancelled their outing to the Sierra Nevada region.

Table 11. How have wildfires (e.g., flames, smoke, blackened scenery, loss of infrastructure) impacted your travels to the Sierra Nevada region of California since 2014? (Nonresidents)

	#	%
Changed destination to other Sierras location	13	35%
Other	13	35%
People in my travel group canceled	11	30%
Canceled trip	10	27%
Left the region early	7	19%
Disappointed could not see mountain scenery	7	19%
Changed accommodation to avoid smoke	5	14%
Fewer photographs	4	11%
Sick from smoke	3	8%
Changed activities to avoid smoke	2	5%
Unexpected trip to view wildfires	2	5%

The survey asked nonresidents about what aspects of a fire most influenced their decision to cancel or change their summer or fall leisure plans to the Sierra Nevada since 2014. Decreased visibility from smoke and regional planned electricity blackouts (done to prevent wildfires) were most influential, with 91% indicating it was extremely to moderately important. Other key influences were outdoor recreation area closures (89%); just the potential of wildfires (88%); health effects of wildfire (86%); lack of infrastructure due to fires (83%) and being burned (80%).

Table 12. How influential were the following on your decision to cancel or change your summer or fall leisure plans to the SN since 2014? At least moderately important. (Nonresidents)

	Extremely to Moderately Important	Somewhat to Slightly Important	Not Important
Decreased visibility from smoke	91%	6%	3%
Regional electricity blackouts	91%	6%	3%
Outdoor recreation area closures due to wildfire	89%	11%	0%
Potential for wildfire	88%	12%	0%
Health effects from smoke	86%	11%	3%
Lack of infrastructure due to wildfires	83%	14%	3%
Being burned	80%	20%	0%

Looking to the future, nonresidents were asked if the potential for future wildfires in the Sierra Nevada region of California would influence their interest in visiting the region. The largest percentage (42%) indicated it would influence their future plans to visit the Sierra Nevada region, while 34% indicated it would not. This suggests wildfire will continue to affect tourist planning to the Sierra Nevada region in the foreseeable future, unless mitigation measures are implemented.

Table 13. Does the potential for future wildfires in the Sierra Nevada region of California, closures or smoke from them, influence your interest in visiting the Sierra Nevada region in the next two years? (Nonresidents)

	#	%
Yes	264	42%
Might or might not	155	24%
No	212	34%
Total	631	

A final set of questions asked all respondents how supportive they are of various forest management techniques in the Sierra Nevada region. Table 14 reflects that all but two received support from at least 77% of respondents; with the most popular being: More funding for forest management to reduce fire risks and impacts (82%); increased funding for more firefighters and infrastructure in the area (81%); controlled burns (80%); and limitations on development in fire prone areas (80%). Regional electricity blackouts received the lowest level of support (60%). These data suggest there is overall strong support from a number of perspectives for forest management and firefighting to reduce fire risks and impacts, but less for regional blackouts.

Table 14. How supportive are you of the following wildfire management techniques in the Sierra Nevada Region of California? (All respondents)

Fire Management Technique	Supportive	Neither	Not Supportive
Increased funding for more forest management to reduce fire risk and impacts	82	14	4
Increased funding in the area for more firefighters and firefighting infrastructure	81	14	3
Controlled burns	80	14	6
Limitations to development in fire-prone areas	80	15	5
Clear cut areas of forest that have burned to prepare for reforestation	78	16	6
Clear cut or thinning of trees around Sierra towns/roads	77	16	7
Other	61	32	6
Regional electricity blackouts	60	25	15

Appendix B. Connections between Sierra Nevada tourism, forest health, forest management and wildfire

The research completed in this project and the findings in other published studies support the notion that Sierra Nevada tourism is linked to forest health, and forest health is related to wildfire and the level of forest maintenance. Figure 4 presents a proposed model of the relationships between tourism, forest health, forest management and wildfire.

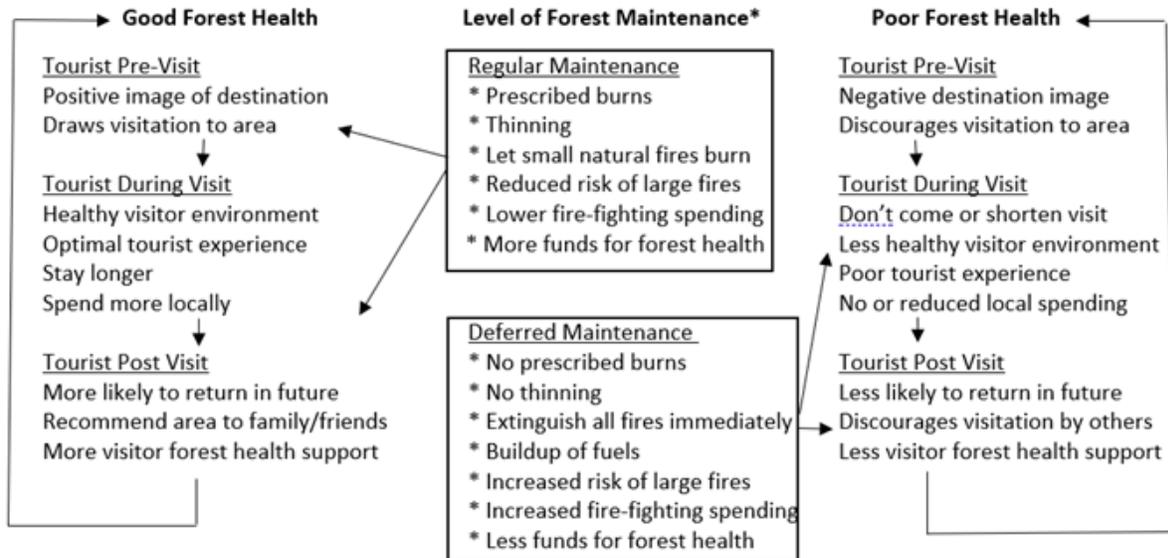


Figure 4. Model of Sierra Nevada Tourism, Forest Health, Forest Maintenance and Wildfire Connections

* The appropriate type of forest maintenance depends on many variables including, wilderness, parks, access, weather, etc.

The proposed model posits tourists considering a visit to a region (pre-visit) with good forest health, are more likely to hold a positive image of the destination which encourages them to actually visit, than potential visitors to an area of poor forest health (such as dying trees and fire scarred landscapes). Visitors to a healthy forest are more likely to find a healthy natural environment, have an enjoyable experience, stay longer and spend more locally. This is in comparison to the visitor experience during a trip to a forest in poor health. After the trip to a healthy forest, tourists are more likely to want to return in the future and recommend it to their friends and family. Focus group and resident and nonresident survey findings support these hypotheses.

“Over one in five of all the summer/fall leisure trips to the Sierra Nevada by nonresident survey respondents over the last 5 years were negatively influenced by wildfire considerations.” Survey of Resident and Nonresident Experiences and Attitudes

The final element in the post trip part of the tourism sub-model is that tourists experiencing a healthy forest are more likely to support additional forest health activities and funding because they have had an optimal experience and want to visit in the future. A positive tourism-forest health feedback loop is created in this instance. This compares to tourists visiting a forest in poor health, who are less likely to support activities and funding for a forest they do

not want to visit in the future. This sets up a negative tourism-forest health feedback loop. Additional research is needed to verify these relationships.

“The areas in the forest that were burnt by the Rim fire are not visited much anymore.”
Angels Camp Focus Group & Interviews

“We’ve seen no impact on visitation from prescribed burns we’ve conducted in the park. People are very supportive.” Mariposa Focus Group & Interviews

The Level of Forest Management component of the model has been analyzed in numerous studies. The Sierra Nevada Conservancy’s 2014 *State of Sierra Nevada Forests* report presents a complete assessment of forest health in the SN and linkages with forest management and wildfire. A recent National Science Foundation study (2018) supports a strong relationship between forest health and forest management, as do focus group results.

“There is a growing understanding that many Sierra Nevada forests are not healthy and that overgrown forests are susceptible to disease and intense wildfires.” Sierra Nevada Conservancy, 2014.

“We’ve known for some time that managed forest fires are the only way to restore the majority of overstocked western forests and reduce the risk of catastrophic fires,”
National Science Foundation, 2018

“We were able to stop the (Rim) fire in areas of prescribed burns. We need to educate the public about the benefits of fire to the forest and to managing future fires. We have a teachable moment now.” Mariposa Focus Group & Interviews

The appropriate type of regular forest maintenance, based on a number of factors, such as land use designation, wilderness, parks, access and weather, can result in a reduction in the risk of large fires. Conversely, deferred forest maintenance tends to increase fuel buildup, encourage catastrophic fires that hurt tourism, increase fire-fighting expenditures and reduce funding available for forest maintenance (U.S. Forest Service, 2015). Reducing large wildfire occurrence through appropriate forest management reduces adverse impacts of wildfire on tourism, which in turn supports local tourism dependent communities. These forest health actions also strongly align with the California Forest Carbon Plan (California Department of Natural Resources 2018) to reduce carbon emissions and meet the state’s long-term climate goals.

“Decades of fire exclusion, coupled with drought and the stressors associated with climate warming, have reduced forest health and dramatically increased the size and intensity of wildfires and bark beetle infestations and have exposed millions of urban and rural residents to unhealthy smoke-laden air. These conditions threaten progress toward meeting the state’s long-term climate goals.” California Natural Resources Agency, 2018.

The model posits there is a direct relationship between appropriate forest management, wildfire, and tourist interest and visitation to a Sierra Nevada. Tourism is an additional justification, along with improving forest health and associated benefits (e.g. watershed improvement and carbon sequestration), for protecting natural resources and appropriate forest management actions in the Sierra Nevada. The model will need to be tested and verified by future research.