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2013 Environ. Res. Lett. 8 044004

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A comprehensive framework for tourism and recreation drought vulnerability reduction

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Received 27 April 2013

Accepted for publication 26 September 2013

Published 16 October 2013

Online at stacks.iop.org/ERL/8/044004

Abstract

The effects of drought are vast, but loss statistics often do not reflect the impacts on the tourism and recreation sector, which for many places is one of the most critical economic drivers. This is concerning because drought events are common across the globe, with varying frequency, duration, and intensity, and are therefore unavoidable. Over the years, drought conditions have been at record levels in many regions, causing deep societal and economic impacts. However, little research has been conducted on connections between tourism/recreation and drought, revealing a distinct disconnect between the tourism/recreation sector and drought management. To bridge this gap in the current understanding of, and approaches to, managing drought in the tourism/recreation sector, we present an interdisciplinary conceptual framework that integrates tourism/recreation into the drought management process to ensure sustainable economic development and community vitality. The model presented here promotes understanding of critical interactions through a bottom-up stakeholder engagement process balanced with formal top-down management approaches.

Keywords: drought, tourism, recreation, resource management, emergency management

1. Introduction

Achieving sustainable water security requires appreciating the full range of interconnections between environment, economy, and society. Community vitality necessitates developing strong adaptive capacity to environmental stressors, including droughts and climate change. The widespread nature of droughts across the globe, coupled with the importance of

the tourism/recreation sector in many places, precipitates the need for investigation and action at this important intersection. Using a classic approach to defining drought (Wilhite and Glantz 1985), the tourism/recreation sector is most sensitive to hydrological and socio-economic droughts. Hydrological drought is linked to the effects of a shortfall in summer and winter precipitation on streamflow, reservoir and lake levels. Socio-economic drought occurs when the demand for water exceeds water supply, for example, due to reduced levels of streamflow or snowpack. Socio-economic drought can have significant impact on community vitality, as the ripple effects span across sectors.



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Of all natural hazard types, drought is, in many ways, the most subtle. This may be because it has a slow onset and does not capture attention in the same way as other more distinctly defined and dramatic disasters. Yet, droughts have far-reaching impacts, both globally and in the US. From the 618 disaster events recorded between 1900 and 2012 internationally⁵, droughts caused over \$100 billion⁶ in unadjusted economic losses (EM-DAT 2012). In the US, an estimated average annual drought loss of \$6–8 billion exceeds that of all other hazard types (NOAA 2002), consistently causing extensive local and regional impacts. Further, individual US historical drought events rank as some of the costliest when considering all types of hazard catastrophes. For example, the 1988 Drought alone cost the US economy \$39 billion (Riebsame *et al* 1991) (\$75 billion in 2012 dollars), making it the second costliest natural disaster after Hurricane Katrina (over \$100 billion), and just exceeding estimates of the 2012 Midwest Drought at \$35 billion and Hurricane Sandy at \$65 billion (Aon Benfield 2013). In spite of the magnitude and widespread geographic extent of severe droughts, economic, environmental, and social impacts are not comprehensively documented for all sectors and regions (Wilhite *et al* 2007).

In many parts of the world, tourism/recreation is a critical economic sector, and anecdotal evidence is mounting linking economic losses to drought, even though the connection is minimally studied or systematically documented. In fact, very little research has been conducted on disasters and tourism generally (Thomas *et al* 2006), and even fewer studies document drought impacts in this sector (Faulkner 2001, Ritchie 2008, Wilhelmi *et al* 2008). An exception to this nearly absent tourism/recreation–drought connection is the monitoring and assessment of winter snowfall and snowpack, often in the context of climate change (Breiling and Charamza 1999, Scott and McBoyle 2001, Gosling and Hall 2006, Scott *et al* 2006, Dawson and Scott 2007, Scott and McBoyle 2007, Scott *et al* 2008, Shih *et al* 2009).

In an attempt to bridge this notable gap in current knowledge at the intersection of drought, tourism, and recreation, we present an interdisciplinary conceptual framework that specifically integrates tourism/recreation into drought management to ensure economic stability and community vitality. The framework guides future investigations that are situated in International Assessment Efforts on Climate Change (IPCC) broadly, and the National Climate Assessment at a national level in the US, which taken together offer information to inform decision-making at the global, regional and local levels. Further, the framework promotes an increased understanding and appreciation of drought effects on tourism/recreation through a bottom-up stakeholder engagement process balanced with formal top-down management approaches. This framework can be

utilized to characterize the relationship between drought and tourism/recreation and also to identify vulnerabilities with a focus on increasing adaptive capacity. The knowledge gained from taking this comprehensive approach can be used to develop more proactive strategies for drought mitigation and climate adaptation that ensures increased communication across all affected groups in the short- and long-term. This approach may also be applied to many geographic locations, and modified for use in other economic sectors.

2. Interactions between drought and tourism/recreation

The economic and social effects of droughts are vast, but loss statistics often do not reflect the explicit impacts on the tourism/recreation sector, one of the most critical economic drivers for many regions around the world. This is particularly relevant because droughts are common in nearly all parts of the globe, with varying frequency, duration, and intensity. Their impacts are becoming increasingly complex (Wilhite *et al* 2007), emerging from a multifaceted interaction between demands for water by humans and the physical availability of water (Wilhelmi and Wilhite 2002, Hayes *et al* 2004).

Drought has direct and indirect impacts on the tourism/recreation sector, and can span all seasons. The most obvious are reductions in water- or snow-dependent activities, such as boating, rafting, canoeing, fishing, snowmobiling, or skiing, resulting from lower water levels or snowpack, as well as from shortened or shifted seasons. Water restrictions can also pose distinct challenges to water-reliant recreation. Intangible relationships are more difficult to quantify and link to drought, such as decreased visitations, cancellations in hotel stays, or a reduction in booked holidays. These could stem from negative perceptions of dryness, fire bans, or wildfires burning nearby vacation destinations (even if these are in actually not in the vicinity). Wildlife viewing or hunting can also be affected through changes in animal and bird migratory patterns, causing reduced revenues for nearby towns and communities. Further, if drought results in negative experiences (for example, water restrictions or viewing a drought-stressed, brown landscape when visitors think it should be green), people may convey this to others, thereby reducing future visits from formerly interested visitors. The outcomes ultimately result in decreased tourist dollars for the local economy and a reduction of sales taxes, potentially even leading to unemployment or social and psychological impacts in the community. These may not be felt equally by all groups; seasonal workers, for example, might be disproportionately impacted.

Existing drought indices used to monitor and assess drought severity, such as the Surface Water Supply Index, Standardized Precipitation Index, or the US Drought Monitor do not incorporate impacts on tourism/recreation (Heim 2002). Certainly, the use of these indices could be utilized by the tourism/recreation sector to prepare for and adapt to drought, but the interplay between drought and this sector is not captured by any of them. In the US, *The Drought Impact Reporter*, launched by the National Drought Mitigation

⁵ Disasters in the EM-DAT database are recorded for: ten or more people reported killed, 100 people reported affected, a call for international assistance, or a declaration of a state of emergency. Thus, these do not represent moderate to smaller events, only those reaching this disaster threshold.

⁶ All losses are reported in US dollars.

Center in July 2005, aims to catalog drought impacts, with 1102 reports out of 24 380 total entries categorized by tourism and recreation recorded since 2005 (National Drought Mitigation Center 2012). While this is not a systematic reporting system, nor does it provide a mechanism for comparison, it is at least the foundation of an inventory, is a mechanism for documenting themes in drought impacts on tourism/recreation, and begins to establish evidence of the drought and tourism/recreation connection.

Unfortunately, the tourism/recreation sector is easily shadowed by drought effects on agriculture. This is not to say that agriculture is unimportant, but rather that the tourism/recreation sector needs additional attention. Using Colorado as one example, tourism/recreation is a major driver of the state's economy, which is similar to economies throughout the western United States. The tourism/recreation sector is second only to agriculture, and generated \$14.6 billion in direct spending and \$750 million in local and state taxes in 2010 (Dean Runyan Associates 2011). Moreover, drought is relatively frequent, occurring in some region of the state nine out of every ten years (McKee *et al* 2000). Another such illustration is the 2011–2012 Drought in Texas, Oklahoma, and New Mexico, states that experience regular drought cycles. Several newspapers emphasized tourism and recreation impacts, even placing estimates at a \$4.6 billion deficit (mywesttexas.com 2012, vindy.com 2011). Although state hearings addressed this sector (Shannon 2012), tourism is never mentioned in the report issued by the Texas Comptroller of Public Accounts, and recreation was given only one bullet point in the assessment (Combs 2012). This focus on agriculture extends to overall drought planning and mitigation, along with climate adaptation measures. Without a doubt, the tourism/recreation sector is equally important for investigation and policy-making, needing additional attention given overall drought losses (Ding *et al* 2011), particularly if and when drought is directly linked to other hazards like wildfires, extreme heat, or even shifts in vector-borne diseases.

Taken as a whole, the evidence illustrates the potential for drought to directly impact multiple sectors and further illuminates the need to incorporate tourism/recreation directly into drought management and planning. A healthy tourism/recreation sector is vital for overall social and economic strength in communities and regions, particularly in places where tourism/recreation makes up a significant portion of the overall economy. Consequently, systematic and consistent assessments and evaluation of drought impacts, along with direct inclusion in drought management strategies are fundamentally necessary, although thus far not commonly conducted, for tourism/recreation (Wilhelmi *et al* 2008).

3. Drought–tourism/recreation vulnerability framework

3.1. Complexity of interactions

The severity of drought impacts vary significantly among communities, largely due to an imbalance between water

supply and demand across sectors and regions, as well as a differential vulnerability to drought among water users. Vulnerability of the tourism/recreation sector to drought is complex, dynamic, and spatially variable. At its core, the conceptual framework presented in figure 1 guides consistent processes that increase dialog between the tourism/recreation sector and emergency and resource management organizations supported by a multifaceted, bottom-up stakeholder-driven process that integrates with, and informs, formal organizational structures. This preserves a community's values, while simultaneously creates a platform for common dialog and communication to identify measures, to conduct assessments, and to enhance the overall community vitality through improved adaptive strategies. The nuanced context of critical tourism/recreation activities with drought linkages are captured through the stakeholder engagement process. In turn, this information is combined with systematically collected drought monitoring data in order to evaluate potential impacts and to arrive at a comprehensive planning and climate adaptation solutions.

By integrating, rather than duplicating efforts, disaster/emergency management and the tourism/recreation sector create conditions and processes where measures from one may be used to inform the other. The framework incorporates the entire disaster management cycle, including preparedness, hazard mitigation, recovery, and response in order to explicitly acknowledge the relevance of these activities along with water management and climate change adaptation approaches. Ultimately, the goal is to reduce vulnerability of tourism/recreation to drought; the framework is structured to guide integrated research and practice through increased collaboration and communication.

Even though recreation and tourism are often treated as a single sector, the framework acknowledges that they have distinct planning needs with regard to water resources and drought, and also generate revenue in varying ways for consideration of economic impacts. The resource management orientation of recreation is perhaps more directly tied to water management than tourism. Further, the amount of money that each visitor spends is also fundamental to revenue generation, which will vary by season and purpose of visit. Active outdoor sporting activities have different water requirements than managed resort-type activities, and revenue generation streams vary. For example, if a campground on public lands does not fill due to fire bans, the direct economic implications are far less than a ski resort not filling rooms due to reduced snow pack. Or, mountain biking is potentially different from horseback riding both in terms of activity needs, water dependency, and revenue generation streams. Golf courses also have distinct water needs, and likely result in greater revenue generation than mountain biking, camping, and horseback riding.

To add to the complexity, drought impacts on tourism/recreation may not be uniformly negative. For example, dirt roads are more accessible when dry than when wet. Access to trails may enable mountain biking or horseback riding to occur earlier or in a wider range in these conditions. In higher latitude areas with lakes, warm, dry weather is often

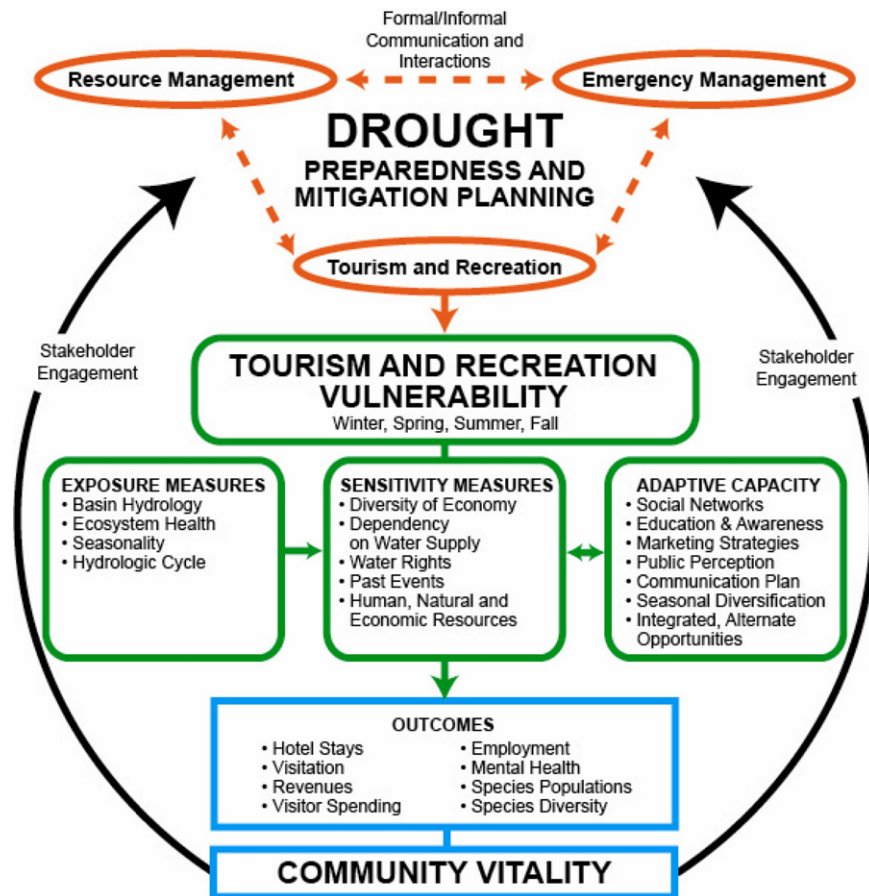


Figure 1. Drought–tourism/recreation conceptual framework.

essential to attract summer vacationers in large numbers. In places where cloudy summers are common, the lack of rainfall during drought could, in fact, have economic benefits for some businesses.

Recognizing that diversity is fundamentally critical for local economies, the framework explicitly incorporates various types of tourism and recreation, as well as their seasonality and dependencies on water use. Understanding individual components of tourism/recreation, and interactions among them, is essential for characterizing the relationships between drought impacts, vulnerabilities, and appropriate drought planning and climate adaptation strategies.

In addition to integrating sectors and directly relevant organizational management structures, this conceptual framework takes an interdisciplinary, comprehensive approach with regard to methods and hazard types. Capturing interactions among recreation and tourism activities at a given location through stakeholder engagement processes, as well as between different hazard types (e.g., drought, wildfire, etc), requires a multifaceted approach. For example, drought cannot be entirely disentangled from wildfires or extreme heat, and these interconnections should be explored, particularly identifying opportunities for cross-planning.

Frequently, drought management lacks quantitative data that provide evidence for informing policy creation and prioritization of drought mitigation measures for minimizing

societal impacts, particularly for tourism and recreation. Many tools, indices, and data exist for monitoring and forecasting physical characteristics of droughts, but few objective, systematic, and comprehensive measures of tourism/recreation and societal impacts are included in vulnerability assessments. For example, visitations or lodging receipts are not linked to decreased water availability to evaluate the connections, thereby limiting drought mitigation opportunities. Additional quantitative and qualitative data, gathered through interviews, surveys, and focus groups can be used to verify, contextualize, and prioritize quantitative measures, as well as to capture local knowledge and perceptions. Fundamentally, these efforts can generate vulnerability reduction strategies specific to the strengths and needs of a particular community.

3.2. Vulnerability of tourism and recreation to drought

Vulnerability, broadly defined as susceptibility to harm, is a fundamental factor for drought disaster risk reduction. Although specific definitions of vulnerability vary, here we draw on constructs from risk and vulnerability research and conceptualize drought vulnerability for the tourism/recreation sector as a function of three interrelated components: exposure, sensitivity, and adaptive capacity (Turner *et al* 2003, Wisner *et al* 2004, Adger 2006, Wilhelmi and Hayden 2010),

all depicted at the center of the framework (figure 1). Hydrometeorological conditions create an exposure to a drought hazard, while features of the socio-ecological system (e.g., land use, water demand, diversity of economic activities) influence the sensitivity of the system to negative drought impacts, and its capacity to respond to, recover from and cope with current and future droughts. Although several analytical frameworks defining these concepts and their interrelationships have been proposed (e.g., Morss *et al* 2011, Wilhelmi and Hayden 2010), the specific indicators and the dynamics among them, especially in the context of drought and tourism/recreation are not well understood or characterized. Factors that contribute to differential exposure, sensitivity, and adaptive capacity increase or reduce drought impacts and directly affect the overall vitality of the communities. Therefore, having a comprehensive and interdisciplinary understanding of these elements of vulnerability and their underlying factors can lead to better characterization of indicators, impacts, and vulnerability relationships for targeting improved drought mitigation and climate adaptation strategies.

Exposure to drought is generally described as environmental and climatic conditions that position a system (e.g., community, industry, sector, population) to be negatively affected by a drought. Exposure is predominantly associated with the physical attributes of the environment, including local and regional climate, features of the landscape as well as hydrologic, land use, and ecosystem characteristics. Along with the variation in these characteristics, exposure to drought varies spatially and temporally. Exposure to droughts during certain seasons or during a particular time of a season can increase or decrease vulnerability to drought and the outcomes for the tourism/recreation sector. Geographic location, for example, can play a major role in how exposed the system is to drought and what the magnitude of the impacts may be. While meteorological drought can occur in virtually any climate (Wilhelmi and Wilhite 2002), certain areas may be particularly susceptible to hydrologic drought and the impacts on the water supply needed for operating tourism/recreation activities. The hydrologic cycle and its role in the water supply–demand relationships is an important factor that determines differential exposure to drought. Many water-based recreation and tourism activities largely depend on access to, and ability to use, surface water. Drought exposure is influenced by the relationships between the water users and their respective sources of water supply. If the area of the water source is exposed to drought, water users downstream can be affected as well. Therefore, basin hydrology, including stream and watershed characteristics, can affect the exposure of surface water users to drought. Previous droughts and other environmental stressors that affect health of natural ecosystems can further increase exposure to drought. Healthy ecosystems can withstand short-term drought without major long-term impacts. For example, the susceptibility of the forest ecosystem in Colorado to the rapid spread of the bark beetle was largely attributed to the stress to trees from previous prolonged droughts (Chapman *et al* 2012).

Traditionally, climate-sensitive industries developed resource management strategies that work with climate variability; however, they have typically assumed the regional climate as stationary (Fussler 2007). Climatic changes, such as warmer temperatures and decreased snowpack, can directly affect winter recreation like skiing, snowshoeing, and snowboarding; and indirectly affect a myriad of water-based recreation through decreased surface water supply, and water levels in streams, lakes and reservoirs (Ray *et al* 2008). A complex interaction between water supply and demand in any given area, droughts and the geographically varying impacts of climate change on temperature and precipitation creates differential exposure of the regions, communities, and businesses. For example, Alvord *et al* (2008) states: ‘considering the impact that seasonal climate variability already has on tourism, projected impacts tied to rising temperatures threaten long-term profit margins of many tourism industries on the Colorado Plateau’ (Alvord *et al* 2008, p 674).

Drought *sensitivity* is represented by non-climatic factors that determine the degree to which the tourism/recreation sector can be affected by a drought. These factors typically represent the attributes of the water demand in any given area and include characteristics of the land use and land management, local economy, and the water policies. Wilhite *et al* (2007) emphasized that the impacts of drought can be significantly exacerbated when the water demand exceeds the water supply either due overdevelopment and over-appropriation, or due to an overall degradation of the natural resource base. In many places, the sensitivity to droughts can be affected by the prior appropriation water rights system. During a drought event, water-right holders can place a ‘call’ on the river which limits or completely restricts the use of water by water users with lower priority water rights within a hydrologic basin. In Colorado, for instance, recreation water rights usually have more junior status than agricultural or mining water rights, which tend to be more senior (HydroBase 2013).

Economic development and dependency on the water supply plays a major role in the degree of drought sensitivity of regions and communities. Importantly, increased economic diversity in communities dependent on tourism and recreation results in greater ability to reduce drought sensitivity and, in turn, drought vulnerability. Wilhelmi *et al* (2008) illustrated that in Colorado, it is critical to diversify the economies in general, as well as diversifying the local businesses that are focused on tourism and recreation to reduce the impacts of drought. Water-dependent businesses, such as rafting, fishing, and reservoir-based recreation companies should have additional sources of income on which to rely during years when sufficient water supply is not as available. Therefore, dependency on water supply presents another factor of drought sensitivity, in particular for summer tourism/recreation activities. Since the 2002 statewide Colorado drought, many Colorado communities have strategically worked to expand the range of tourism/recreation activities and to increase the flexibility and diversity in local economies, in general. Examples

include lighter boats for whitewater rafting or 'off season' activities, such as rock climbing, jeep touring, or road biking (Alvord *et al* 2008). In many cases, experiencing a severe drought positively affected the attitudes and the policies toward drought preparedness and mitigation, and decreases the sensitivity to future droughts. While the direct link to drought is not well documented or understood, there was evidence in some cases that businesses and communities that were operating in already marginal or depressed economic conditions, were unable to fully recover and may have become even more sensitive to future droughts.

Adaptive capacity refers to the potential of a system to adjust or modify its features or actions so as to better cope with current or future drought impacts (Turner *et al* 2003, Adger *et al* 2004, Adger 2006, Wilhelmi and Hayden 2010). Adaptive capacity influences adaptation, which refers to the actual adjustments or changes made to cope with droughts and reduce their impacts. In the context of tourism/recreation, adaptive capacity is influenced by factors such as social capital and social networks, in particular public relations, communication and marketing strategies, knowledge, attitudes, practices, and public drought risk perception, as well as access to information and alternative, adaptive technologies. Understanding adaptive capacity is a key gap in drought vulnerability research, particularly as it relates to the tourism/recreation sector.

While exposure and sensitivity can be, for the most part, measured by quantitative data, adaptive capacity is often nuanced and best examined qualitatively or at the business or individual level (Morss *et al* 2011). Individual and institutional knowledge, attitudes, and practices regarding drought and tourism/recreation can have major influence on actual responses, economic and cultural adaptations, and water management. However, the combination of attitudes, access to resources, and adaptive technologies affects the willingness and ability of a community or business to change practices and operations in order to reduce drought vulnerability and increase community resilience.

Social and organizational networks among regions, communities, and business, along with improved communication mechanisms with the media and the public, can greatly increase adaptive capacity and lead to fewer economic losses and damages from a drought (Wilhelmi *et al* 2008). More recently, social media has added to the complexity of information dissemination, providing both opportunities and challenges for promoting tourism/recreation. The 2002 Colorado Drought illustrated that public perception of drought and climate conditions at popular tourism destinations are as important as the actual conditions themselves (Alvord *et al* 2008, Wilhelmi *et al* 2008). In fact, the Colorado Tourism Office developed the first crisis management plan for communication and messaging during times of disaster after the 2002 experiences (Colorado Tourism Office 2012, CWCB 2010). Effective communication and public relations are clearly keys to improved climate adaptation and drought vulnerability reduction.

3.3. Data collection and stakeholder engagement at all levels

Taken together, exposure, sensitivity, and adaptive capacity are direct drivers of drought vulnerability and overall community vitality. Thus, they can have positive or negative forces on outcomes that should be measured, recorded, and evaluated over time. Outcome measurement data might include: hotel stays, visitation, revenue, visitor spending, employment, mental health, species populations, or even species diversity. While some of these outcome measures are fundamental to recording, documenting, and tracking drought impacts, and by extension evaluating the effectiveness of adaptive measures (i.e. negative impacts would be reduced if adaptive capacities are effective), some measure will be locally defined. For example, information on snowpack and soil moisture coupled with data from resource managers about where fire mitigation has recently occurred could provide the tourism/recreation industry with information on the most appropriate places for issuing camping permits for the upcoming summer season. In doing so, there could be a corresponding reduction in possible wildfire exposure, reducing the burden on emergency managers. Outcome measures will also act as a feedback loop for informing overall drought preparedness and mitigation measures, such as water conservation. Importantly, these measures should be developed through direct engagement with local stakeholders (bottom-up) in the context of formal management structures at the local, state in the case of the US, and national (top-down).

Stakeholder engagement underpins the entire data collection process for arriving at improved adaptive strategies for drought vulnerability reduction in the tourism/recreation sector. Frequent interactions with, and among, the stakeholders can ensure that the data regarding exposure, sensitivity, and adaptive capacity inform local decisions to further build the adaptive capacity to drought. Although certainly challenging and requiring dedication and resources, community engagement has the potential to achieve the following: (1) interpret and evaluate current data sources, (2) identify additional data that could be relatively easily collected, (3) establish priorities for the development of new data sources, and (4) document best practices and adaptive strategies. Sustained stakeholder engagement hinges on effective and multipronged participation strategies, the generation of meaningful products from data, and a dissemination strategy.

4. Conclusions

This is the first conceptual framework that presents a research and operations roadmap for reducing tourism/recreation vulnerability to drought, having far-reaching potential for application to communities globally, and in the US. It suggests approaches and processes for producing empirical data that support the integration of tourism/recreation into drought management, and provides a model that should be evaluated for its applicability in different geographic settings. Although the key concepts included in the framework are transferable, the details of implementation would vary from location to location. For example, water rights and water access operate

quite differently in various places, as would the particular stakeholders necessary in the engagement process. Still, the overarching framework guides a process for understanding the pathways for the reduction of tourism/recreation vulnerability. This is critical for increasing community vitality, particularly where this sector plays an important role in the community.

Additionally, the framework provides a mechanism for enhancing an understanding of the effects of regional and global climate change as it relates to tourism/recreation. For example, applying this framework would inform the development of a robust US National Climate Assessment, which aims to ‘analyze the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and analyzes current trends in global change...’ (United States Code 1990). Drought impacts have the potential to influence nearly all of these areas, particularly as related to the health of the tourism/recreation sector.

While drought causes significant impacts on communities, currently no systematic approach comprehensively assesses tourism/recreation vulnerability to this devastating natural disaster. Without adequate information on tourism/recreation during non-drought periods, it is difficult, if not impossible, to properly evaluate opportunities and challenges for increasing preparedness and implementing adaptive capacity measures. Additionally, information generated from the application of the proposed framework can provide practitioners and decision makers alike with a more accurate and comprehensive assessment of drought vulnerabilities, along with a basis for comparison across communities and over time.

Acknowledgments

This study was funded by the generous support of the Colorado Water Conservation Board. Additionally, we gratefully thank the anonymous reviewers who provided extremely constructive comments that improved the quality of the paper.

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