Creating an Effective PSAR Program for Wilderness

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Abstract

Search and Rescue (SAR) programs are instrumental in saving the lives of outdoor recreationists with the first recorded SAR operations in 1926. Due to the advancements in technology, recreationists have been able to travel deeper into outdoor settings, which causes problems for SAR efforts if rescue is needed. This has caused a significant increase in the costs of SAR operations. Recently there has been a movement to try and reduce the number of SAR operations by implementation of Preventive Search and Rescue (PSAR) programs. Federally designated Wilderness areas present unique hazards compared to managed recreation areas based on travel restrictions and a "do nothing" approach to management. These factors need to be highlighted for visitors who intend to recreate within Wilderness and are unaware of the hazards that may be present. The objective of this research was to identify a target audience for Wilderness specific PSAR programs, identify key characteristics of a successful PSAR program, and determine key information to be conveyed to Wilderness users. This information was gathered through a comprehensive literature review, an overview of four case studies, and the use of a SAR and PSAR participant survey. A review of the literature revealed a target audience for PSAR messages to be young males engaging in day-use hiking activities. Trained employees and volunteers for trailhead contacts and trail patrols, PSAR messages on signage directed toward the target audience, and online PSAR presence emerged as the three main methods for visitor education through the case studies. Lastly the SAR and PSAR participant survey identified key Wilderness specific information to be used within the methods for visitor education. The incorporation of the information from the SAR and PSAR participant survey along with the methods for visitor education identified by the case studies of successful PSAR programs can lead to the reduction of SAR operations that take place within designated Wilderness areas.

I. Introduction

Search and Rescue (SAR) organizations have been assisting people for years in order to save the lives of injured or lost recreationists. The job of SAR organizations is to search for and provide assistance to individuals that are distressed or in imminent danger. Through the formal establishment of SAR within the National Search and Rescue Plan in 1956, the U.S. Coast Guard was named responsible for any maritime SAR operations and the U.S. Air Force for any inland SAR operations (www.uscg.mil, 2015; Villella & Keen, 2014). The U.S. Coast Guard carried out 38,282 SAR responses in the year 2014 (www.uscg.mil/, 2015). The responsibilities of SAR operations are carried out by individuals who may be employed, or volunteer for an agency to carry out SAR operations. SAR operations are not only hazardous for the people who require assistance, but also to the specialized SAR team that is dispatched because they must overcome the elements that have led to the user requiring SAR assistance. There has recently been a push to educate people before they engage in activities within outdoor recreation areas that could prompt the need for SAR assistance. These programs are called Preventive Search and Rescue (PSAR) programs.

PSAR programs have become established in outdoor recreation areas to influence users and reduce the need for search and rescue operations because of a growing population. The primary reason for the establishment of PSAR programs is to not only reduce the number of SAR operations through visitor education on safe practices and preparedness, but also reduce costs of SAR operations by reducing the overall number that occur each year (Manning, 2003). With increased numbers of recreationists, the number of SAR operations has increased as well, leading to higher costs for the use of specialized SAR teams to remove people from danger (Heggie & Amundson, 2009; Manning, 1998). There is a greater need for education through PSAR activities

due to the increased number of people that are participating in outdoor recreation activities such as hiking, mountain biking, backpacking, and other activities (Manning, 1998; Manning, 2003).

PSAR programs have been designed as a broad approach to the education of visitors in order to reduce SAR operations. A broad scale approach becomes challenging when trying to adapt a program to a specific area that may have different rules about travel guidelines and management of hazards compared to other outdoor recreation areas. Federally designated Wilderness fits this criteria as Wilderness is meant to provide opportunity for solitude as well as limited access and travel restrictions due to the prohibition of any forms of motorized travel allowed within Wilderness as stated under the Wilderness Act of 1964. A PSAR program that takes the restrictions of travel and the differences in management into considerations has yet to be developed and implemented for Wilderness. This paper will identify the key components of a successful Wilderness PSAR program through the analysis of successful PSAR programs and the identification of core PSAR elements based on a survey of SAR and PSAR participants.

II. Background

i. History of SAR

SAR organizations were assisting outdoor recreationists' removal from harm's way as early as 1926. The first ever recorded organized SAR operation took place in Oregon, and was organized by a group of outdoor enthusiasts who saw a need for the SAR service. This group, also known as the Crag Rats, is the oldest known SAR organization still in existence (Villella & Keen, 2014). There were times preceding 1926 where a group of highly skilled and knowledgeable individuals were called upon to perform a SAR operation, but not as an organized unit (Cooper, 2005). Events that took place during World War II sparked further

advancements in technology, as well as, the publication of a field guide for SAR (Villella & Keen, 2014). Throughout the next several decades, state governments began to oversee SAR organizations which began developing and growing across the country. Today, SAR is carried out at the federal, state, local, and private level. At the federal level, the U.S. Coast Guard is in charge of all maritime SAR operations, the Air Force oversees inland SAR operations, the Department of the Interior on National Park Service lands, the Department of Agriculture oversees U.S. forest lands, and the Bureau of Land Management oversees all other U.S. owned lands (Villella & Keen, 2014, U.S. Department of the Interior, 2011).

ii. Need for SAR

SAR events are triggered when someone is hurt, lost, or in danger and cannot seek help from local law enforcement or medical staff because of their location. As defined by the U.S. Coast Guard, SAR is, "the use of available resources to assist persons and property in potential or actual distress" (www.uscg.mil, 2015). Two major factors leading to the need for SAR operations are the lack of adequate equipment and unexpected weather changes (Opacic, 2011). Within national parks, 48% of SAR incidents between 1992 and 2007 were caused by hiking accidents and 21% by boating accidents (Villella & Keen, 2014). Although there are some cases where incidents are unavoidable, a majority of operations are caused by reckless behavior or unskilled actions (Manning, 2003). A number of these SAR incidents could most likely be prevented if visitors understood the potential for injury during their intended activity and planned ahead for safety precautions.

Throughout the years of SAR operations, there have been general trends emerging as to who is getting injured and the method that is used to contact SAR to provide assistance. Studies have analyzed the results of SAR activity over specific time periods in a specific places. Results

indicate that the gender of the individual or individuals needing assistance is an important indicator of who PSAR messages should be directed towards. In all of the studies examined, males were the majority of victims who found themselves in need of assistance (Ela, 2004; Hung & Townes, 2007; Heggie & Heggie, 2008; Heggie & Heggie, 2009; McIntosh et al., 2010; Boore & Bock, 2013). These studies also identified the average ages of those requiring SAR assistance to be between the ages of 20 and 39 years of age (Ela, 2004; Hung & Townes, 2007; Heggie & Heggie, 2008; Heggie & Heggie, 2009; McIntosh et al., 2010; Boore & Bock, 2013; Reynolds et al., 2012). The activity in which the victim was participating is another major factor that was recorded within these studies. Hiking stands out as the activity that a majority of visitors were doing when they required SAR assistance (Ela, 2004; Hung & Townes, 2007; Heggie & Heggie, 2008; Heggie & Heggie, 2009; Boore & Bock, 2013; Reynolds et al., 2012). These studies suggest that the target audience for PSAR information should be directed at males between the ages of 20 and 39 who are intending to hike as their recreation activity.

PSAR programs have been growing in popularity due to the increasing number of people participating in outdoor recreation, as well as, increased costs of SAR operations. Studies have shown that there has been an increase in the number of day use visitors in Wilderness areas, often making up over half of the use population (Papenfuse et.al., 2000). The increases in visitor use has also led to increased cost of SAR operations with, "total SAR costs ranged from a low of $2.7 million in 2000 to a high of $4.9 million in 2005" (Heggie & Amundson, 2009).

PSAR programs take a variety of forms where they are implemented, but all focus on providing needed information to visitors in order to ensure that they have a safe and enjoyable experience. PSAR programs incorporate a variety of elements including interpretative signage, PSAR rangers engaging with visitor's face to face, online materials about an area, and

information at trailheads, and visitor centers. PSAR programs are generally tailored specifically to the areas where they are implemented based on the risks that may present themselves at those locations. For example in 1995, Denali National Park started a program for mountaineering safety that utilized a 3 tier approach, starting with at least a 60-day early registration period, purchase of a climber use fee, and participation in a climber orientation program that covered safety tips and equipment checks (Villella & Keen, 2014). This was one of the earliest known PSAR programs. Since then there have been other types of programs started around the country. Two major ones that exist today are the Grand Canyon PSAR program (http://www.nps.gov/grca, 2015) and the Yosemite National Park program referred to as YOSAR (http://www.nps.gov/yose, 2015, www.friendsofyosar.org, 2011). Both of these programs use multiple types of visitor outreach ranging from in person contacts to web podcasts that convey PSAR messages to the visitors who come to their parks to recreate. Understanding what differences there are between managed recreation areas and designated Wilderness areas can increase the likelihood that a Wilderness PSAR program will reduce the number of SAR operations.

iii. Wilderness

The increased number of SAR operations and their costs highlighted in the previous studies regarding SAR activity include managed recreation areas and Wilderness areas. These areas as set aside for protection by the 1964 Wilderness Act are meant to be areas that, "(1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation" (Wilderness Act, 1964). Designated Wilderness areas are meant for people to experience nature in its most primitive form by primitive forms of

transportation, and to understand a connection with it through opportunities for solitude and aloneness.

Wilderness is somewhat unique compared to other types of recreation areas in terms of the experiences had by visitors and the areas management. As defined within the Wilderness Act of 1964, these areas are meant to serve as, "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain" (Wilderness Act, 1964). For users of Wilderness areas, there are limitations on what is and is not allowed within the boundaries of Wilderness. For example, the act stated that, "no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area" (Wilderness Act, 1964). These rules limit users to primitive forms of travel, such as, hiking, kayaking or canoeing, and horseback. There has been debate over how to properly manage Wilderness areas because of the restrictions listed within the act, which limits the use of equipment that can be used for land management (Cole, 2001). These areas are meant to serve as places where man has not had an impact on the land and where the relationship between the land and the earth's processes are unaltered. This has led to a "do nothing" approach to the management of Wilderness areas, which implies that managers do not enter Wilderness areas in order to make alterations to the land even in the case of a disturbance, such as a fire (Manning, 2003). The lack of development within these areas present unique risks associated with traveling inside a Wilderness area. One of the most apparent is the high potential for there to be inconsistent cellphone reception. An increasing dependence on cellular devices for communication could lead to problems within Wilderness areas where there is no reception, and the individual or group is in need of SAR

assistance (McCool & & Freimund, 2016). Advancements in technology have caused changes in the way that Wilderness is being perceived and used by visitors and managers.

iv. The Role of Technology

Recent technological advancements have brought about new ways to think about the use and management of Wilderness areas. Devices such as satellite phones, personal locator beacons, drones, motorized paragliders, and social media are changing the way that the public is interacting with Wilderness areas (McCool & & Freimund, 2016). Some of the new technology can benefit Wilderness areas, where others can have negative effects on Wilderness character and meaning. Social media for example can have both positive and negative effects by introducing people to new places for them to explore, as well as to deface Wilderness by not respecting the rules of Wilderness resulting in areas being altered or damaged by human impact (Wick, 2016; Watson et al., 2016). These new technological advancements can lead to increased conflict between user groups within Wilderness areas. For example, users trying to enjoy the opportunities for solitude that are provided while encountering other users that are using technology that would disrupt the experience of other users. Recent studies have identified an increasing demand for outdoor recreation using new technology such as personal video and audio devices, leading to conflicts between groups that are accustomed to enjoying Wilderness as defined by the Wilderness Act of 1964 and these new groups who are engaging in Wilderness with technology (Wick, 2016; Watson et al., 2016).

New technological advancements and their increased use are creating a need for changes in regulations as to how Wilderness is managed and being portrayed to the public to enforce the ideas of solitude and unconfined recreation. The use of technology by unexperienced users has created a false sense of safety while traveling into these areas and an over reliability on this new

technology to be able to save them in the case of an emergency situation (Wick, 2016; Watson et al., 2016). An effective PSAR program should inform users of the limitations that technology holds within the Wilderness setting. Four different PSAR programs have taken the limitations of technology and management into account when developing their programs to reduce the number of SAR operations that take place each year.

III. PSAR Program Analysis

Three formalized PSAR programs and a pilot PSAR program were analyzed to determine key elements of a successful PSAR program. Two of these programs are located at Yosemite National Park (NP), and Grand Canyon National Park (GRCA) and were implemented to address the increased costs of SAR operations and increased visitation to these areas (www.nps.gov/yose, 2015; www.nps.gov/grcn, 2015). The third program is in Canada and aims to get more people outside and safely enjoying outdoor activities (www.adventuresmart.ca, 2105).The pilot national forest PSAR program was created out of a partnership between the US Forest Service and Northern Arizona University to implement the first PSAR program on the Coconino National Forest, located in Flagstaff, Arizona. Each of the programs analyzed uses a variety of techniques to ensure visitors to the parks and Wilderness areas have safe and enjoyable experiences. Each program was analyzed to identify techniques used to connect with visitors and convey their messages of preparedness. The core elements found through analysis of these programs form the basis for a Wilderness PSAR program that federal agencies can implement and personalize to their respective Wilderness areas.

i. Yosemite NP PSAR Program

Yosemite National Park's PSAR program began in 2007 in response to an increase in visitor fatalities and emergency situations (Hung & Townes, 2007). The park itself sees between 2 and 3 million visitors per year between the months of May through September and provides many opportunities for outdoor recreation including hiking, rock climbing, site-seeing, fishing, and water activities during the summer months. There are 748,036 acres of land with approximately 800 miles of trails for visitors to visit and enjoy (www.nps.gov/yose, 2015). Some of the hazards that visitors may encounter while in the park include wildlife interactions, trails in close proximity to cliffs, extreme heights, wide ranges in temperatures, and more. A study reviewing SAR operations analyzed a 10 year period from 1990 to 1999 in which 1,912 SAR operations took place within the park boundaries (Hung & Townes, 2007).

Alan Hageman, the PSAR Supervisor for Yosemite NP stated that, "our goal is visitor education. Most of our visitors are unfamiliar with the Park's hazards" (Hageman, 2016). Alan explained how through the parks organization and layout with stores, restaurants, and lodging for visitors, the park gives recreationists a false sense of safety almost like "an urban theme park". The problem of lack of preparedness for activities arises when visitors leave these developed areas of the park and venture into areas that they have not been before and are unaware of the hazards while having the false sense of safety that has been instilled when they initially entered the park. The goal of the Yosemite NP PSAR program is to educate visitors of the hazards they may encounter while engaging in recreation activities in order to reduce the occurrence of SAR operations.

The educational element of Yosemite NP's PSAR program focuses on three main messages to portray to the visitors. The first message is to stay on the designated trails

(Hageman, 2016). This message has risen from past SAR operations where recreationists have decided to venture off a designated trail and end up either getting injured or lost due to conditions outside designated recreation areas.

The second message that is conveyed through the park's PSAR program is that all visitors that intend to engage in physical activities at the park need to drink lots of water and snack frequently on salty easy-to-digest foods (Hageman, 2016). Dehydration, a major problem in Yosemite NP as well as in other recreation areas, is easily overlooked by visitors and can have serious health consequences. Current science has found there is a positive correlation between particular cognitive abilities and mood states and water consumption (Masento, 2014). Victims of dehydration have been found to make poor judgements during their activities such as cutting trail to shorten their hike, or to approach swift water too closely, leading to a higher potential for injury or fatality (www.friendsofyosar.org, 2011). It is very important that visitors maintain adequately hydrated in order to make sound judgements while recreating.

The last message that Yosemite NP tries to convey about safety is to leave an action plan with a trusted person that includes times, routes, vehicle information, and any other plans for their intended stay (Hageman, 2016). This information is important for the initiation of a SAR operation in the case that the person or persons do not have the ability to initiate the operation due to injury or location as well as giving the participants in the SAR operation a general idea of where to look for the missing or injured person or people.

In addition to these three messages, other messages conveyed to visitors during their stay at the park include the need to carry with them the 10 essentials, most of all a light source (Hageman, 2016) (Table1). The 10 essentials for outdoor recreating are a list of items that will assist a person or people in either finding their way back to where they began, surviving longer

than was previously expected due to complications during their activity, or treating an injury sustained while recreating until further help can be seeked. At the park, park staff and signage try to convey the overall message that visitors are responsible for their own safety while recreating within the park boundaries.

Table 1. The 10 essential items recommended for hiking during the summer months at Grand Canyon National Park (www.nps.gov/grca, 2015).

10 Summer Hiking Essentials	
1	**Water** - plain and some with electrolyte replacement.
2	**Food** - especially salty foods. Eat twice as much as normal.
3	**First Aid Kit** - bandaids, ace wrap, antiseptic, moleskin, etc.
4	**Map** - while many trails are well-marked, maps are helpful tools.
5	**Pack** - to carry the essentials.
6	**Flashlight/Spare Batteries** - allows you to hike out during the cool of the evening.
7	**Spray Bottle** - fill with water for your own personal air conditioning system.
8	**Hat/Sunscreen** - to keep the sun off you and protect your skin.
9	**Whistle and/or Signal Mirror** - for emergency use.
10	**Waterproof Clothing** - poncho or jacket; especially useful during monsoon season (mid-July to early September).

The second element of the PSAR program at Yosemite NP is based around how they convey the messages discussed above to their visitors. Alan Hageman understands that there is not one simple way to get these messages out to their visitors, so they have implemented a multitude of techniques for outreach. One strategy is the use of volunteers. Hageman stated that, "the cornerstone of PSAR is a small army of volunteers who patrol our most active trails in a

recognizable T-shirt and ball cap" (Hageman, 2016). PSAR volunteers are trained to identify signs of fatigue and dehydration as well as to interact with users participating in risky behavior. The role of these volunteers is to engage hikers in conversation and offer friendly suggestions about potential changes to their intended activity if they appear to be ill prepared for their current activity. PSAR volunteers not only patrol high use trails, but also engage visitors on shuttle buses and at trailheads in order to interact with users before they embark on their activity.

Along with volunteers, Yosemite NP employs other types of outreach through the use of multimedia. One of the most notable forms seen by visitors is the use of PSAR signage to educate visitors of potential dangers and suggested equipment. Signs can be found at trailheads and hazardous locations within the park with direct warnings on them about what the hazards in the specific area and how to mitigate them. Safety messages are placed on park buses to draw visitor attention to PSAR efforts within the park. In addition to the signs, seasonal safety messages are also published in the local "Yosemite NP Guide" paper that is given to all visitors entering the park (Hageman, 2016). A recorded PSAR message is played through speakers inside the Fresno airport to target those visitors who travel from long distances to get to the park. These messages are meant to serve as reminders to visitors about park safety and potential hazards.

There is also a large PSAR presence on the Yosemite NP web site for visitors who are seeking information before their intended trip. The web site contains information about seasonal hazards, such as high temperatures during summer months, risks associated with particular trails within the park, and wildlife encounters. The use of social media web sites such as Facebook, Twitter, and Snapchat are also used as forms of visitor outreach about park attractions, as well as, advertisement for educational seminars and events within the park to promote a safe environment for recreation. Yosemite NP has its own set of pages on government web sites that

highlight park features as well as PSAR information including essential items to bring and the ability to plan a trip in advance before arriving at the park. There is also a PSAR specific web page planned for Yosemite NP that will contain additional information such as a podcast about how to have a safe trip, specific items for intended activities, and previous SAR information for future visitors to know in order to have a safe visit. This web page is currently just a shell, but will likely be expanded in the spring of 2016 (Hageman, 2016).

Additional PSAR efforts are made through in person interactions off the trail. Yosemite NP rangers hold a weekly campfire program for visitors to attend and learn about the park's history and other features that the area has to offer. During these weekly programs, PSAR messages about preparing ahead and the need for the 10 essentials are woven into the material to pass on to park visitors. One effort in particular targets youth interested in the outdoors and adventure. This is the PSAR-specific "Junior Ranger book and earned patch" (Hageman, 2016). The Junior Ranger book shows children visiting the park the hazards such as dehydration and potential injury from traveling off-trail that one could run in to while recreating within the park. The book tells youth of specific ways to mitigate these hazards through preparation before the activity, or actions to take, such as staying on trail. Lastly, Yosemite NP ensures that all park staff, volunteers, and interns are well versed in PSAR information for the dual purpose of ensuring their own safety and so that they can promote the PSAR message during contact with park visitors (Hageman, 2016).

Through the growth of the formalized PSAR program, Yosemite NP National Park has seen success in changing visitor behavior. In the PSAR Annual Report for 2015 at the park, it was reported that, "During fiscal year 2015, there were no drownings within Yosemite NP" compared to between two to five each year (Hageman, 2016). Since the formalization of

Yosemite NP's PSAR program, the park has seen a reduction in the overall numbers of SAR operations from the first year of data collected in 2009 when there was 7.2 SAR's per 100,000 visitors. During the fiscal year of 2015, the number of operations dropped to 5.53 SAR's per 100,000 visitors. Table 2 below shows the year-to-year comparison of SAR operations to total number of visitors to the park to illustrate the PSAR programs effectiveness. The PSAR team at the park increased the amount of time spent making visitor contacts during the 2015 fiscal year allowing for an increased number of notable contacts with visitors (Table 3). These "notable contacts" are those that PSAR members were able to assist or educate visitors engaging in risky behaviors or who were unprepared for their intended activity before there was a need for a SAR. By continuing to increase the overall number of hours and contacts, Yosemite NP hopes to reduce the number of SAR operations by increasing the amount of visitor education.

Table 2. Yearly statistics for Search and Rescue operations that took place within Yosemite NP National Park compared to the overall number of recreational visitors to the park (www.nps.gov/yose/, 2015).

YOSEMITE NP NATIONAL PARK SAR STATISTICS MAY THROUGH SEPTEMBER			
	SARs	**Recreational Visitors**	**SARs per 100,00 Visitors**
2008	N/A	2,334,970	N/A
2009	186	2,584,486	7.20
2010	172	2,727,106	6.30
2011	147	2,798,133	5.25
2012	172	2,650,060	6.49
2013	137	2,503,893	5.47
2014	149	2,574,696	5.78
2015	148	2,677,214	5.53

Table 3. Number of hours and contacts that PSAR volunteers made with visitors within Yosemite NP National Park from 2010 through 2015 (www.nps.gov/yose/, 2015).

PSAR STATISTICS YOSEMITE NP NATIONAL PARK			
	HOURS	**VISITOR CONTACTS**	**NOTABLE CONTACTS**
2010	1,428	33,400	N/A
2011	953	N/A	N/A
2012	1095	13,550	1,862
2013	1,068	12,110	1,702
2014	1,875	18,987	2,175
2015	2,895	27,060	4,692

ii. Grand Canyon PSAR Program

A similar story to that of Yosemite NP underlies the PSAR program at Grand Canyon National Park. The park saw 5,520,736 visitors during 2015 come through the entrance gates into the park (irma.nps.gov/Stats, 2015). The park spans 1,217,403 acres containing 277 river miles, and trails that descend the steep canyon walls down to the river (www.nps.gov/grca, 2015). The main hazards encountered while at the park are the steep canyon walls and the high summer temperatures for those traveling into the canyon. As a result the SAR hotlines can respond to more than 400 calls per year asking for assistance within the canyon from injury or dehydration. It is because of these high visitation numbers and SAR operations that GRCA created its formalized PSAR program in 1998 (Yee & Iserson, 2008). Through 17 years of PSAR activities at GRCA, their program has been refined to address the audience at the park as well as to identify key components that make it successful.

The GRCA PSAR program was created following the summer of 1998, when the park was faced with five heat-related deaths, 300 heat-related SAR operations, and a record total of 482 total SAR operations (Yee & Iserson, 2008). As a result, a group of 10 rangers banded together to create a program that would enhance visitor safety on the park's hiking trails and backcountry. This action formed what is now GRCA's formal PSAR Team.

The current PSAR Team is made up of one full-time supervisor, seven seasonal rangers, and more than 60 volunteers who all work toward two goals (Malcolm, 2012). The primary goal of the GRCA PSAR team is to, "hike Grand Canyon's most visited trails interacting with and educating the public on safe hiking, defined as the "Hike Smart" campaign" (Malcolm, 2012). A second goal is to assist individuals down trail in need of medical, physical, or psychological intervention (Malcolm, 2012).

The PSAR Team focuses most of its energy on face-to-face interactions between rangers or volunteers and visitors. Rangers and volunteers will deploy onto trails between 7:30am and 6:00pm on any given day at the park. They focus their efforts on the Bright Angel, South Kaibab, and North Kaibab trails as these see the most visitor use. The PSAR Team also can be found on some of the other non-corridor based trails such as Hermit, Grand View, Tanner, and Widforss trail. The PSAR rangers and volunteers are trained to identify key signs of a lack of preparation and give suggestions to visitors as needed. Rangers and volunteers greet hikers on the trails, usually in a place with good visibility of a section of trail and an area where visitors can be adequately assessed for their level of preparedness such as a rest stop or water checkpoint (Malcolm, 2012).

Paired with the on-trail interactions, visitors encounter directed signage informing them of the consequences of not being prepared for their intended activities while visiting the canyon. These signs display a variety of messages including information about trail lengths and elevation gained and lost on the major trails, potential hazards that could be encountered while hiking, such as snakes, and descriptions of common reasons for SAR assistance to hikers within the park. These messages displayed on the signs are not meant to scare park visitors, but to make them think about the consequences if they are not adequately prepared (Malcolm, 2012).

For visitors who are planning ahead for their trip using the Internet, there is a large PSAR presence on the GRCA web site. On the GRCA "Hike Smart" web page, the first message displayed is a caution about hiking conditions at the canyon. This message describes the risk taken by visitors who engage in strenuous activities within the canyon that often results in injury and even death. This message is followed by a list of the 10 essentials for outdoor activity (Table 1). Along with the 10 essentials list, messages urge visitors to make sure that they stay hydrated while engaging in physical activity because the hot summer months can cause the body to sweat out a large amount of liquids. Visitors are reminded to replenish electrolytes that the body loses through sweat. The Hike Smart web page also informs visitors that it is fairly hazardous to hike during the hours of 10am-4pm, the hottest hours of the day, and that even with proper hydration, even athletes run the risk of overheating and heat stroke (www.nps.gov/grca/learn/photosmultimedia/hike_smart, 2015).

In addition to the warnings and hazards web page for GRCA, the PSAR Team has created an online podcast for future visitors to listen to in order to best prepare for their intended visit and most of all, stay safe. This podcast series is made up of 5 parts, each with its own individual take home message to allow for a safe and enjoyable visit to GRCA (www.nps.gov/grca, 2015). The first podcast in the series discusses what PSAR is and the duties they perform for the park. This allows visitors to engage with PSAR in some form, so that when encountered on-trail within the canyon, the visitors are not alarmed at the questions they may be asked.

The second podcast discusses the 10 essentials for outdoor recreation and how important they are regardless of the length of activity the user is engaging in. Even though one may not have to use all 10 of these essential items, they become of upmost importance in the case of an emergency for either the individual themselves or others they may encounter. The third podcast covers the

topic of physical preparedness before engaging in the intended activity. This includes a self-assessment of previous injuries and, if needed, consulting a physician is suggested before engaging in strenuous activities within GRCA. The fourth podcast in the series covers the topic of self-rescue tips to help with common situations that hikers find themselves in within the canyon such as insufficient water and food and lack of physical ability to complete a planned hike. The last podcast in the series pertains to those who plan to hike into the canyon with infants and toddlers. These tips will help protect children from heat illness, dehydration, sunburn, and falls as the canyon presents a high risk for these sort of dangers to children (www.nps.gov/grca/learn/photosmultimedia/hike_smart, 2015). Through these audio podcasts provided by the GRCA PSAR Team, visitors can plan a trip that will best ensure their safety while engaging in outdoor activities within GRCA.

Through the use of the techniques described above, the GRCA PSAR Team efforts have had a significant impact on SAR operations at the park. Before the implementation of the PSAR program, GRCA was experiencing approximately 9.4 SAR operations per 100,000 people that entered the park (Yee & Iserson, 2008). After implementation of the PSAR Team, GRCA saw a drop in that number in the following years to an average of 7.7 SAR operations per 100,000 visitors. This drop of 1.7 operations per 100,000 visitors resulted in a $300,000 fiscal year savings for the park (Yee & Iserson, 2008; Malcolm et al. 2014). A more recent study found that between 2008 and 2012, the canyon saved $398,532 per year as a result of its PSAR efforts (Malcolm, 2012). The PSAR Team reduced the number of heat related SAR's by 42% from 2008 to 2012 (Malcolm, 2012). Models simulating environments without a PSAR presence versus actual SAR and PSAR data show that the PSAR Team prevented approximately 21% of SAR's during the months of May through September starting after the PSAR Team began patrolling the

trails (Malcolm, 2012). The methods used by GRCA have been successful at the park scale. Canada has taken a slightly different approach to a larger scale PSAR program.

iii. PSAR in Canada

Canada has created a PSAR program on the national level in order to help get more people engaged in outdoor activities and do so safely. Their program, called AdventureSmart, combines the use of online resources with on-site awareness and targeted outreach in order to reduce the overall number and severity of SAR operations (www.adventuresmart.ca, 2015).

The AdventureSmart program has a slogan to help promote its message that reads, "Get informed and go outdoors" (www.adventuresmart.ca, 2015). This slogan embodies the objective of their program that aims to get more people, Canadians or tourists, outdoors. But the slogan also implies that people need to be informed before going outdoors. AdventureSmart informs people using two main methods, online education and on-site training

The first method used to inform future users of the essentials needed to engage in recreation safely is through online activity specific pages that contain information about the essential items to have during an activity, as well as, potential hazards to prepare adequately in the event of an emergency. For example, the page specific to hiking lists 7 items, such as hiking boots, bug spray, extra clothes and socks, and mole skins for blisters, and an additional 6 items suggested for overnights in the outdoors. Along with specific activities, AdventureSmart also targets specific age groups with some of its information sessions, such as its "Hug a tree and survive" program that targets children in grades K-5th of how to avoid becoming lost in the woods, and what to do in case that they do. These online orientation materials are a resource that

can be easily used before first attempting a particular activity to understand what to expect and to be adequately prepared in the case of an emergency.

The second strategy AdventureSmart uses to inform users is on-site awareness at specified locations across the country. People can register for an assisted introductory lesson to a specific activity taught by trained presenters. A group of people may request a private lesson for a certain activity to be led for their group, or at a school or business by submitting a presentation request form on their web site and providing information about the activity, time, location, audience, and contact information. This allows flexibility in times and places that potential users have in order to be able to attend an introductory lesson for an activity. Along with flexible lessons, if an individual finds a passion for a certain activity, they may become a certified presenter for that activity such as backpacking or kayaking. This involves going through specific training to ensure that the individual has the ability to present the information required and demonstrate the activities and actions required by the AdventureSmart program.

The AdventureSmart program structures its information and safety programs around three basic principles (www.adventuresmart.ca, 2015). The first principle is trip planning, which dictates that the person or people who are intending to recreate for a single or multi-day stay, create a detailed plan containing locations, times in and out of cell phone service, and check-in times, and leave it with someone that is a close relation in the case of an emergency. The second key principle is training. Training is acquisition of the skills and knowledge that are required before departing for the intended activity. This principle is deeply rooted in the on-site awareness trainings, and allow individuals to gain skills in a safe learning environment before attempting activities for the first time unassisted. The last principle is, “always take the essentials”. The

AdventureSmart essentials are similar to those of the 10 essentials used by GRCA, and are listed in Table 4 below (www.adventuresmart.ca, 2015).

The AdventureSmart program is offered through the collaboration of multiple organizations within Canada. The list includes the National Search and Rescue Secretariat (NSS) in collaboration with its federal, provincial/territorial, municipal and volunteer SAR partners, injury prevention specialists and corporate partners who manage development and delivery of the AdventureSmart program. The 2016 statistics from January to March for the program include 11,488 total participants and 1,323 total presenter hours. A breakdown of the number of participants of the individual programs are displayed in Figure 1 (www.adventuresmart.ca, 2016). The number of participants has been growing year-to-year since 2009, showing that more people are benefitting from safety information provided by AdventureSmart.

Through education, AdventureSmart hopes to reduce the number of SAR operations across the country while increasing the overall number of people enjoying outdoor recreation opportunities. On a smaller scale, a pilot program in Arizona attempts to reduce SAR operations on the single most used trail on the Coconino National Forest.

Table 4. The list of essential items that individuals should have with them during outdoor activity as suggested by AdventureSmart (www.adventuresmart.ca, 2016).

Taking the Essentials	
1.	Flashlight
2.	Fire making kit
3.	Signaling device (i.e. Whistle)
4.	Extra food and water
5.	Extra clothing
6.	Navigational/communication devices
7.	First aid kit
8.	Emergency blanket/shelter
9.	Pocket knife
10.	Sun protection

AdventureSmart Statistics	
Participants since Jan. 1, 2016	
AdventureSmart Overview and Promotion	219
Hug-A-Tree and Survive	6,520
Presenter workshop - Hug a tree	72
Presenter workshop - PaddleSmart	26
Presenter workshop - Snow Safety	18
Presenter workshop - Survive Outside	42
Presenter workshop - Survive Outside Snowmobiling	68
Reste pres d un arbre	457
Snow Safety Education	191
Survive Outside	1,299
Survive Outside Snowmobiling	60
Tradeshows	2,200
Trailheads	316
Total Participants	11,488
Total Presenter Hours	1,323

Annual Statistics		
Year	Participants	Presenter Hours
2016 YTD	11,488	1,323
2015	37,574	5,169
2014	39,512	5,093
2013	22,114	3,109
2012	20,180	2,622
2011	19,427	2,214
2010	17,886	2,070
2009	2,450	422

Figure 1. Statistics of the AdventureSmart program including participation, presenter hours, and previous annual statistics, 2009-2016 (www.adventuresmart.ca, 2016).

iv. Coconino National Forest PSAR

The Coconino National Forest is located in Northern Arizona and managed by the U.S. Forest Service. In the summer of 2015, through collaboration with Northern Arizona University, the forest created a pilot PSAR program for the most highly used trail on the forest. The

Humphreys Peak Trail is the busiest trail on the forest largely because it reaches the highest point in the state of Arizona at 12,633 feet above sea level. The trail averages between 100 and 200 people per day on the weekends and holidays during the summer months (Lee et. al., 2015). Because of the high use, the trail and surrounding area has a higher number of SAR operations during the summer months compared to other trails on the forest, according to the Coconino County Sheriff's Office SAR coordinator, Aaron Dick. The trail contains a variety of terrain from flat single track to sections of steep shale. The trail also gains roughly 3,500 feet of elevation over the course of 4.9 miles (www.fs.usda.gov/recarea/cocnino, 2015).

The PSAR program was initiated to educate visitors and raise awareness of the difficulty of the trail in order to reduce potential SAR operations. The PSAR staff was made up of one full time PSAR ranger who coordinated, trained, and organized groups of volunteers to work as PSAR volunteers (Lee et. al., 2015). The PSAR program employed several methods in order to achieve the goal of reducing SAR operations.

The first method for raising awareness was an informational booth stationed at the trailhead that visitors had to walk by before embarking on their hike up the trail. The informational booth was staffed during the hours of approximately 8:00am to 4:00pm, Friday through Sunday, and Mondays for holiday weekends during the months of May through August, 2015. One full time PSAR ranger, and at least one PSAR volunteer were stationed at the booth during these hours to make contacts with visitors, provide additional information about the trail, trail conditions, weather forecasts, and answer any other questions had by visitors. Along with the PSAR staff, the booth provided written information on common weather occurrences to avoid, such as lightning, and how to best mitigate those situations. Also available was information about common health risks associated with hiking the trail due to its difficulty,

location, and elevation-related hazards. PSAR staff at the booth engaged in conversation with hikers as they approached the trailhead while visually assessing the preparedness of the hikers compared to their intended destination. If the PSAR staff felt as though the individual or group of individuals was not fully prepared, they would offer advice and recommendations about additional equipment, food, water, that they may need, or offer suggestions of different trails to hike that they appeared to be better prepared for. Free informational handouts on Leave No Trace ethics and the 10 essentials for outdoor activity were also given to visitors to for future outdoor activity in order to ensure safe and enjoyable experiences were had while recreating.

The second method for raising awareness came later during the 2015 summer with the incorporation of PSAR trail patrols during the times that the booth was set up at the trailhead. One or two of the PSAR staff would travel up the trail equipped with supplies such as extra food, water, and a first aid kit to assist those in need. Upon reaching the halfway point of the trail to the summit, the trail patrol waited and engaged hikers in conversation. During these conversations, the PSAR staff assessed if the hiker or hikers needed any assistance, or further recommendations of changes they may want to make to their plan in order to safely complete their activity. The trail patrol would leave their post on the trail and head down trail to meet back at the trailhead by 4:00pm, while continuing to engage visitors heading up the trail to offer advice and assistance to those in need. Contact was kept between the trail patrol and the PSAR booth staff via the use of handheld radios to relay information about hikers that were of concern in order to be ready in the case of an emergency to follow emergency protocol to assist the hiker or hikers.

During the course of the summer, PSAR staff collected visitor use data during the time that they were stationed at the trailhead. From the summer months of May through August, 2015,

the PSAR program on Humphreys Peak Trail encountered on average between 100 and 250 people on trail per day every Friday through Sunday with a total of 8,180 visitors being contacted. In addition, almost 200 of those people planned on summiting the mountain on a particular day. Each day, between 5 and 10 visitors were offered alternative routes compared to their original intended plan (Lee et. al., 2015). The data collected from the summer of 2015 are displayed below in Table 5.

Table 5. Visitor contact information gathered by the Humphreys Trail PSAR team throughout the summer of 2015 (Lee et. al., 2015).

Month	May	June	July	Aug
Average number of visitors encountered per day	116	193	209	225
Average number of people intending to hike Humphreys per day	72	183	197	208
Average number of people intending to summit per day	37	158	179	199
Average number of visitors offered an alternative each day	5	10	5	13
Average number of visitors that changed their plans each day	6	7	5	5
Average number of visitors engaged by volunteers each day	86	103	99	112
Average percent of visitors prepared for their intended activity each day	79	86	87	84

During the months of May through August, 2015, Coconino County Sheriff's SAR (CCSSAR) engaged in two rescue, and four search operations on the Humphreys Peak Trail. In the previous summer of 2014 during the months of May through August, CCSSAR engaged in four rescue, and six search operations on the Humphreys Peak Trail (Dick, 2015). This showed a 50% reduction in rescue operations and a 34% reduction in search operations in 2015 over 2014.

More information is needed to directly link these reductions to the efforts of the PSAR team but suggest that the PSAR efforts contributed to the reduction of SAR operations on the trail.

IV. SAR and PSAR Participant Survey

Examining the PSAR programs in Yosemite NP National Park, Grand Canyon National Park, Canadas AdventureSmart program, and the PSAR pilot program on the Coconino National Forest provides valuable insight into what makes a successful PSAR program. A survey of SAR and PSAR participant managers and volunteers was conducted to identify key messages they felt would most benefit Wilderness visitors before their intended visit or activity. The survey asked participants about their perceptions of current trends in visitor use of Wilderness areas and information that should be presented to Wilderness visitors.

The survey was distributed online using Surveymonkey.com, a data collection service. Once the survey was created, the web link for the survey was disseminated to SAR and PSAR participants through two SAR group email lists. One list was made up of individuals who had participated in SAR activities within the Southwest and was maintained by the Coconino County Sheriff's Office. The second group of participants was contacted through the Arthur Carhart National Wilderness Training Center and distributed to wilderness managers who had SAR or PSAR experience. The survey was intended to target individuals who had experience working with either SAR or PSAR programs at a variety of levels ranging from city to federal levels as volunteers and paid employees. The sample included 249 survey respondents.

The first set of questions asked survey respondent to identify the target audience for PSAR information. The first question asked, "From your personal experience, how prepared are the majority of recreationists that enter federally designated Wilderness areas for day use

activities? (1-Not at all prepared 10-Completely prepared)". More than half of survey respondents felt that the majority of recreationists who plan on entering a federally designated Wilderness area for day use are less than moderately prepared for their intended activity (Table 6). None of the respondents indicated that Wilderness visitors were completely prepared for day use activities.

Table 6. Survey responses to the question regarding Wilderness visitor preparedness for day use activities (n=187).

1. Not At All Prepared	2	3	4	5	6	7	8	9	10. Completely Prepared
0.5%	8.6%	24.1%	19.3%	26.2%	8.6%	9.6%	3.2%	0.0%	0.0%

The next question dealt with multi day visitors. The question asked, "From your personal experience, how prepared are the majority of recreationists that enter federally designated Wilderness areas for multi day stays? (1-Not at all prepared 10-Completely prepared)". According to respondents, the majority of multi day users of Wilderness area are more than moderately prepared for their intended activity (Table 7). This suggests that the target audience for PSAR information should be single day users compared to multi day users based on perceived preparedness for intended activities.

Table 7. SAR and PSAR participant survey responses to the question related to Wilderness visitor preparedness for multi day stays.

1. Not At All Prepared	2	3	4	5	6	7	8	9	10. Completely Prepared
0.0%	2.2%	6.0%	4.3%	8.1%	18.4%	29.2%	25.4%	6.0%	0.5%

Following level of preparedness, survey respondents were asked a question designed to better understand what items Wilderness users neglect to bring with them during their visit. The question asked survey participants to list the top three items they believe Wilderness users neglect to bring with them that could make the difference between being safe and needing SAR

assistance. The most commonly listed item by SAR and PSAR survey participants was proper clothing and footwear for the intended activity (23.7% of responses). Second was maps or navigation equipment other than cell phones (21.9% of responses) followed by adequate food and water (17.8% of responses). In addition to these three items, respondents were asked about their opinions on additional information that would be useful to Wilderness users.

Survey participants were asked to list any information that they felt should be added to online government web pages to help visitors prepare for their intended Wilderness activities. Examination of the responses revealed nine key informational topics that respondents thought would benefit users to have available before visiting a Wilderness area. The most commonly mentioned item with was a quality map, or the ability to download one for navigational purposes (16.8% of responses). The second most needed information was equipment recommendations for clothing and apparel to complete certain activities comfortably (14.5% of responses). The third most commonly recommended item was active weather updates for their location and future weather forecast (10.0% of responses) (Table 8).

Table 8. Information that should be included on Government web pages for Wilderness visitors.

	Important Information for Government Web Pages	% of Respondents
1	Quality Maps (Or links to good maps)	16.8%
2	Equipment recommendations for the area (refer to Q#4) (Clothing and Equipment)	14.5%
3	Active weather updates for location and future forecast	10.0%
4	Local Hazards and how to mitigate them	9.7%
5	Important phone numbers for location	6.4%
6	Cell coverage warning (Do not rely on phone)	6.2%
7	Seasonal changes in conditions	5.9%
8	SAR stats from the area (locate at top of web page as so it is first thing seen) (3 major incidents)	5.6%
9	10-essentials & LNT principles	4.5%

The next question fell along similar lines, asking for recommendations for information to be displayed at the entrances and trailheads leading into Wilderness areas. This information would better help visitors make last minute decisions about their preparation for their intended activity. Through analysis of the responses, eleven information sources that should be displayed at Wilderness entrances were identified. The top three most commonly recommended items for trailhead and entrances were potential hazards and descriptions of the trails and terrain of the area (20.3% of responses), the recommended clothing and equipment needed for the area regardless of the season (8.7% of responses), and the general SAR statistics for the area to inform visitors of what hazards have led to the need for SAR assistance in the past (7.6% of responses) (Table 9).

Table 9. Information that should be displayed at the entrances and trailheads leading into designated Wilderness areas.

	Wilderness Entrance Visitor Information	% of Respondents
1	Hazards (terrain, wildlife, weather) & descriptions	20.3%
2	Recommended clothing and equipment regardless of season	8.7%
3	General SAR statistics for the area	7.6%
4	Important local phone numbers in case of emergency	7.2%
5	Groups stay together signage	7.0%
6	Trail register with outside person to contact in emergency	6.6%
7	Directed message signage e.g. "does anyone know where you are?"	6.4%
8	QR codes or online information for downloadable maps	5.1%
9	Trail ratings and general completion times	4.7%
10	Daylight hours	4.4%
11	Cell coverage warning (Do not rely on phone)	3.9%

V. Conclusions and Recommendations

Because the use of Wilderness areas is increasing and the average day user is not prepared for outdoor recreation and may have an unrealistic reliance on technology for personal

protection, the need for a Wilderness specific PSAR program is apparent (Wick, 2016; Watson et al., 2016). In addition to cell phones, new advancements in technology are allowing for users to travel further into the backcountry than before without adequate training and preparations. This causes issues with users having a false sense of confidence based on their equipment, but still lack the skills to complete the tasks that they initially intended to do. Based on the definition and rules about travel restrictions within Wilderness, SAR operations become severely dependent on the user to be able to either save themselves or maintain a stable state for an extended period of time while a SAR team works to find and remove them from danger (mountainrescueblog.wordpress.com, 2013). It will often take double the amount of time for a SAR team to be able to assemble, search, and arrive at the victim's location if the exact location is known. In the case of a missing person, this can take much longer due to the need for someone else to report the person missing in the first place, and then for a SAR team to search an area based on potential last known locations in order to find them. For these reasons, it is apparent that a PSAR program for Wilderness is needed.

Analysis of the PSAR programs in Yosemite NP National Park, Grand Canyon National Park, Canadas AdventureSmart program, the pilot PSAR program on the Coconino National Forest and a survey of current and former SAR and PSAR participants revealed three key elements of a PSAR program for Wilderness. The three key elements include the use of employees and trained volunteers for face to face contacts, directed signage that displays PSAR safety messages and specific location information placed at trailheads and Wilderness entrances, and the use of online web pages specific to Wilderness areas that display additional PSAR safety messages and trip planning information.

The first and most important key element is the use of employees and trained volunteers to function as trailhead contacts and trail patrollers in order to make contact with users to provide recommendations or assistance to individuals who are participating in recreation activities prior to and during their Wilderness visit. These interactions are important because volunteers can actively inform Wilderness visitors about preparedness for their activity rather than relying on the visitor to self-assess their own level of preparedness. In-person interactions are also helpful when Wilderness visitors require basic assistance or additional questions about the specific area that may not be listed within the signage at the location for their activity. Yosemite NP National Park has found the use of trained volunteers on popular trails to interact and assist visitors in need as the most important part of their program, according to the PSAR Supervisor for Yosemite NP (Hageman, 2016). The use of volunteer on-trail patrols is also the main component of the GRCA's PSAR program. Both parks attribute much of their success in reducing SAR operations to this aspect of their programs. The pilot program on the Coconino National Forest used trail patrols in their program as well and found that having a point of contact on the trail allowed for more assistance to users during their activity to prevent emergency situations. Canada's PSAR program did not directly use a trail patrol aspect, but did incorporate the use of trained guides for the supervision of group activities.

The second key element of a successful Wilderness PSAR program is the use of directed and informative signage placed at trailheads and Wilderness entrances. These signs should incorporate information about the specific trails within the area, their descriptions and lengths, recommended equipment for a variety of activities, important telephone numbers for the area in the case of emergencies, and quality maps either at the trailhead or downloadable to a cellular device. In doing this, the Wilderness users will think more critically about their personal

preparation for the planned activities and how they may need to make changes to their plan in order to stay safe.

Wilderness trailhead and entrance signage must include safety messages including those listed by the Yosemite NP program, such as stay on trail, in addition to the three items identified by SAR and PSAR survey respondents that are commonly overlooked by recreationists leading to emergency situations. The three items are proper clothing and footwear for the intended activity, adequate food and water, and a GPS or navigation equipment. Because of the importance of these items to users in ensuring that a safe experience is had within Wilderness, sign content should stress the need for these items as well as recommendations for type of apparel and amount of food and water needed by users. Key information useful to Wilderness visitors that should be displayed on trailhead signs and entrances to Wilderness areas that display important local telephone numbers in the case of an emergency, general hazards in the area such as lightning strikes, and cell coverage warnings and how to mitigate them. GRCA uses signage at trailheads and high volume areas within the park to inform visitors of the hazards that exist within the canyon such as dehydration and wildlife. These messages are directed at users with pointed statements in order to catch visitor's attention and ensure that they are aware of the consequences of not being prepared for their activities. Yosemite NP uses signage in locations where risks are apparent. The messages are designed to help visitors understand that they are in charge of their own safety. The Coconino National Forest pilot program used informative signage at a trailhead booth to better depict hazards of recreation in that particular area for users who were unaware of what they may be attempting. The Canadian program does not incorporate the use of signage due to their primary interactions with visitors being through multimedia and in-person interactions.

The last key element of an effective Wilderness PSAR program is the use of a well-organized website that displays safety information for specific Wilderness locations. The website should be designed to assist visitors who use online resources in planning their activities before reaching the Wilderness. The website should include maps of the area that can be downloaded for use, equipment recommendations based on intended activity, active weather updates and future forecasts for the area, information about the local hazards located within the area, local emergency contact information, cell coverage warnings, seasonal changes in conditions to be expected, recent SAR reports, and a list of the 10 essentials and Leave No Trace principles. The website will need to have all of this information displayed clearly and be easy to navigate. By doing this users will be more aware of the risks associated with the chosen location, how to properly prepare for those risks, and be adequately prepared to rescue themselves if the risk could not be averted in order to avoid the need for SAR assistance. Canada uses online tutorials to inform visitors on recreation risks, equipment, and other necessary information to safely complete the recreation activities prior to obtaining the skills for the activity. Yosemite NP and GRCA both use online resources to inform potential visitors of hazards present within the parks as well as recommendations for equipment, preparations, and optimal times for engaging in outdoor activities. Yosemite NP also takes advantage of using pre-recorded messages played in the local airport and within the bus system at the park. GRCA and Yosemite NP also use podcasts for potential visitors to listen to and use the information to plan and prepare for their future visit.

Analysis of the literature on SAR trends, PSAR examples along with survey results identified the target audience for a Wilderness PSAR program as young, male, day-use hikers. SAR and PSAR survey respondents felt single day users were less prepared for their intended

visit compared to multi-day users who were thought to be more than moderately prepared. The target audience should be males between 20 to 39 years of age. This demographic has been identified as the most likely to engage in higher risk activities which may result in injury or a need for SAR assistance. Analysis of literature also revealed that the most likely SAR victim is engaging in recreational hiking, suggesting that PSAR preparedness messages should focus on this specific recreational activity.

To manage for the increased amount of Wilderness use and rising costs of SAR operations, Wilderness PSAR programs must be implemented to educate users and ensure that visitors are having a safe and enjoyable experience. Successful PSAR efforts rely on the knowledge of the target user audience to properly direct messages about safety and hazard mitigation during their intended Wilderness visit. A reduction of SAR operations resulting in cost savings within Wilderness areas could be achieved through the integration of the three key elements of a successful Wilderness PSAR program. A comprehensive review of Wilderness users and the information they find useful to reduce the potential for SAR operations, as well as the methods in which they research information for a planned Wilderness visit would assist in supporting the key elements of a successful Wilderness PSAR program found within this paper. The continuation of analysis of Wilderness PSAR programs such as the Coconino National Forest pilot PSAR program would allow for greater insight into the association of PSAR programs with the reduction of SAR operations and the effectiveness of the three key elements defined within this study on the success of PSAR programs within Wilderness areas.

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