WORCESTER POLYTECHNIC INSTITUTE

RESPONSIBLE RECREATION

Creating Effective Video Resources For White Mountains Visitors

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THIS PROJECT IS AN INTERACTIVE QUALIFYING PROJECT (IQP) SUBMITTED TO THE FACULTY OF WORCESTER POLYTECHNIC INSTITUTE LOCATED IN WORCESTER, MASSACHUSETTS, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE.

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Abstract

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- *Corey Dehner, Director of White Mountains Project Center and Associate Teaching Professor*
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The White Mountain National Forest has seen an increase in hiker rescues and visitor unpreparedness. The goal of the project was to develop a series of videos that provide visitors with the knowledge they need to stay safe while enjoying the forest to the fullest. We used an iterative design process informed by communication and feedback from peers, US Forest Service (USFS) employees, and visitors to design videos that teach visitors "responsible recreation," a blend of hiker readiness and environmental stewardship. The series "White Mountains: Enjoy Your Hike!," includes videos titled "Hiker Responsibility," "Water Safety," "Wildlife Safety," and "Leave No Trace." We recommend that the Forest Service continue to test the efficacy of, expand outreach for, and add upon this video series.

Acknowledgemets

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Additionally, we would like to thank Colleen Mainville, Public Affairs Specialist for the WMNF, for sharing her experience, resources, and connections with our project group to help us create reliable and usable products.

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Background: Introduction

Established in May of 1918, the White Mountain National Forest (WMNF) in New Hampshire is home to a stunning, diverse, and fragile ecosystem. With approximately 1200 miles of hiking trails, 160 miles of Appalachian Trail, and 23 campgrounds, the White Mountains attract visitors from all over the world (*Facts about the White Mountains (USFS)*, n.d.). The front country offers a safer and more padded experience for those looking for an easy visit, and for people looking for a more hardy time, the backcountry is vast. The United States Forest Service (USFS) manages the WMNF, along with 153 other national forests. The USFS wants to "conserve resources through a balance of activities and uses, including wildlife habitat, wilderness, recreation, clean water, timber and forest products" (*Facts about the White Mountains (USFS)*, n.d.).

White Mountains National Forest

Dangers in the White Mountains

Hiking comes with inherent risk, but there are some dangers unique to the WMNF that contribute to its reputation as being one of most dangerous mountain ranges in North America. The volatility of weather is one of the largest contributors to the adverse events we describe in this paper. Weather conditions change rapidly, the average wind speed at the top of Mt. Washington is 38mph, and the temperature at the summit is typically around 20°C colder than the valleys; for someone who is unprepared and lacking a jacket, these factors could quickly lead to hypothermia (*Mount Washington Observatory | Normals, Means, and Extremes | Mount Washington Observatory*, n.d.; *Hypothermia|Winter Weather*, n.d.).

There are an average of 190 rescues every year in the White Mountains, in total having cost the state upwards of $250-300,000 annually and putting the responders at risk (*Search and Rescue in New Hampshire*, 2021). This can be increasingly frustrating in events where the situation could have been easily prevented. In the majority of search and rescue situations, as well as adverse events in general (such as minor medical incidents), inexperience is a root cause (Daniel et al., 2021; Mannberg et al., 2018).

Increased Visitor Population

Forest recreation is on the rise as more people have found the mountains to be a safer solution to socialization as we endure the lasting effects of a global pandemic (Ferguson et al., 2023).

As we have spoken with various forest service employees, it became apparent that the forest, trails, and areas of recreation were being swarmed with more visitors. Researchers recognized the surplus in outdoor recreation and its direct connection to environmental degradation (Wu et al., 2021). Studies prove that the National Park Service visitation has been increasing exponentially over the past 50 years. In 1974, 26 million visitors were accounted for; 101 million visitors in 1989; 276 million visitors in 2004; and 327 million visitors in 2019 (Ferguson et al., 2023). There is no room for environmental degradation if recreators want to practice forest safety.

Figure 1: Photo of Mount Adams from Mount Madison

This visitation spike is due to the coronavirus pandemic in addition to the country's growing population. Scholars at the University of New Hampshire say that a population increase as large as 60% has affected New England national forests' because of coronavirus (Hoplamazian, 2022).

Background

What is "Responsible Recreation"?

Our project focused on education and entertainment, which are two of the four components used to characterize the different aspects of responsible recreation (Weng et al., 2022). Responsible recreation directly correlates to the experiences the visitors are having and the information being presented to them.

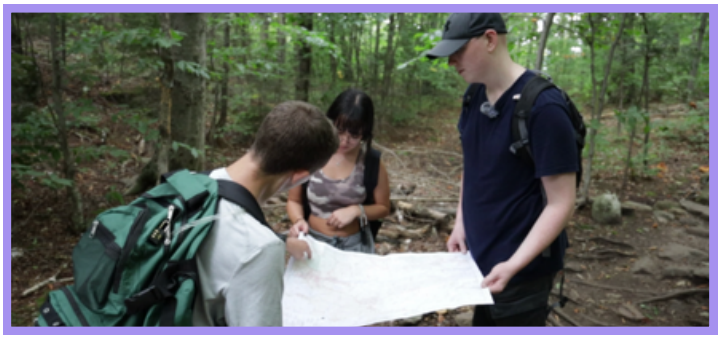

Figure 2: Screen Cap from Hiker Responsibility Video

Responsible recreation requires a level of preparedness that goes beyond the scope of many lower-stake leisures – this is especially true for a backcountry recreationist. The temperamental environments that exist in the WMNF require recreators to be prepared for a multitude of medical and environmental conditions. A recreator must be educated on the White Mountains themselves, including staying up to date on the weather conditions and terrain of the forest (Weng et al., 2022). While national forests can be a great place to get engaged with nature, it is important to remain vigilant of one's safety and impact on the land.

What it Means to be Prepared

Preparedness in the White Mountains requires some degree of backcountry skill. The extent of backcountry skill depends on the ruggedness of the environment and the remoteness of the trail. Our sponsor said that being prepared can include: hiking and backpacking experience, having appropriate clothing, being able to read a map, fire safety, and water safety. According to research, the self-assessed recreation level of backcountry visitors plays a significant role in the recreators preference for rigorous and intensive forest experiences (Mannberg et al., 2018).

That being said, the research also shows that the self-assessed experience level of a backcountry recreator plays little to no part in a recreator's willingness to complete a trail or slope even if they were unaware of its intensity. The willingness of less experienced backcountry recreators' to accept a rugged trail spiked from 11.3% to 77.7% when they encountered the trail unexpectedly (Mannberg et al., 2018). This is a dramatic 66.4% increase. The glaring issue is that inexperienced recreators are finding themselves underprepared for unexpected environments.

Figure 3: The 10 Essentials

The volatile conditions of the White Mountains can turn an inconvenience into an emergency. In an attempt to prevent such emergencies, a list of 10 essential items (see *Figure 3*) was established to better prepare visitors. The items were a whistle, compass, light, first aid kit, rain gear, extra food, extra water, extra clothing, fire, and a map (Daniel et al., 2021). In a survey of hiker habits, the top five reasons for omitting one or more items from the "10 essentials" list were: hikers believed they were taking a short trip, they forgot, they felt as if they did not need certain items, they felt secure hiking under the daylight, and were confident in the good weather forecast (Mason et al., 2013). However, all of these reasons quickly fall apart under the rapid condition changes in the White Mountains. Preparedness is an obvious aspect of responsible recreation – environmental stewardship may be less apparent.

What it Means to be Environmentally Friendly

Part of being a responsible recreator includes environmental responsibility. Sustainability – to maintain a healthy and resilient forest – is often a centerpiece in conversations about environmental consciousness.

Background

Figure 4: Brendan Sheehan Following "leave-no-trace"

To the U.S. Department of Agriculture sustainability is about the "...commitment to [agency] reduce greenhouse gas emissions..." and investing in the "... natural infrastructure to protect clean air, healthy soils, and drinking water." Much like the skill set needed to safely recreate, environmental consciousness is multifaceted. Different recreational behaviors can alter the ecosystem (pH levels of water and soil, wildlife, etc) to various degrees (Wu et al., 2021). Being friendly towards nature means limiting the impact on wildlife and on the environment; in fact, there are "leave-no-trace" principles idealized for this concept (Wu et al., 2021). The "leave-no-trace" principles are similarly promoted and adhered to by the WMNF Visitor Center. Some of these principles are: plan ahead; camp on appropriate surfaces; dispose of waste properly.

To be a safe and conscientious environmental steward encompasses the wellbeing of everyone who visits the forest. To maintain forest safety means that the forest is open for recreational, scenic, scientific, educational, conservation, and historical usage (Smith & Gray, 2021). Education leads to a stronger appreciation for the value of the forest when people visit. Feelings of attachment are formed when people learn more about the forest, which directly motivates environmentally friendly behavior (Zhang et al., 2023). In order to encourage environmental stewardship and visitor safety in the White Mountains, federal agencies have implemented a variety of educational campaigns.

Previous Efforts

Since the establishment of the USFS in 1905 and the Fish and Wildlife Service in 1940, the federal agencies have designed and carried out various educational ad campaigns to create safer and cleaner forests. An early example of Fish and Wildlife outreach, and citizen science, was the push for Canada goose conservation in the 1960s and 70s. Using educational books and pamphlets, the US Fish and Wildlife Service encouraged citizen participation in goose conservation. The campaign was so effective that Canada geese, at the time a species nearing extinction, exploded in population resulting in the large flocks of non-migratory geese seen in the United States today (Dill & Lee, 1970; Kistler, 2007). A more modern example of citizen science is the Trail Stewardship Act of 2016, which seeks to involve the public in the upkeep of the National Forest and its ecology. Additional examples of the USFS's science communication and outreach include Smokey Bear, the face of forest fire prevention, and Woodsy Owl, the child-friendly promoter of environmental consciousness. These characters are a result of the USFS working in tandem with the Advertising Council, a non profit organization that produces Public Service Announcements (PSAs) and other educational media. After almost 80 years of existence, these mascots have continuously evolved in both design and medium (Ad Council, 2021). A timeline of these outreach campaigns can be seen in *Figure 5*.

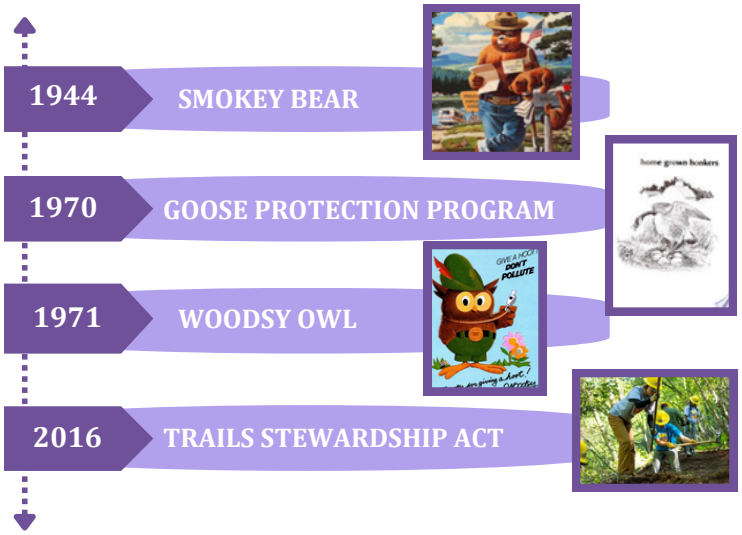

Figure 5: Timeline of Past Outreach Efforts from the Forest Service

Background

Besides these country-wide campaigns, the WMNF rangers conduct public outreach specific to their region. As of September 2023, there is an official Twitter account and Facebook page with 26 thousand and 34 thousand followers respectively. These social media accounts post a mixture of images, consisting of the mountains, upcoming events, weather updates, and general environmental warnings, as shown below in Figure 6. The majority of posts receive around 40-80 likes, according to Nicolette Keown, Lead Visitor Services Information Assistant Scientist and sponsor of this project (personal communication, April 5, 2023). The Public Affairs Specialist of the WMNF, Colleen Mainville, posts once a day on Facebook, and the Twitter account is much less active. The WMNF has an official website with information on water safety, trail conditions, and general hiking and camping safety (Forest Service, 2023). Lastly, the WMNF makes a variety of information available for visitors to take with them. Informational pamphlets, including maps of the trails, are available at the visitor center. While this diversity in options is positive, the efficacy of these mediums has left much to be desired.

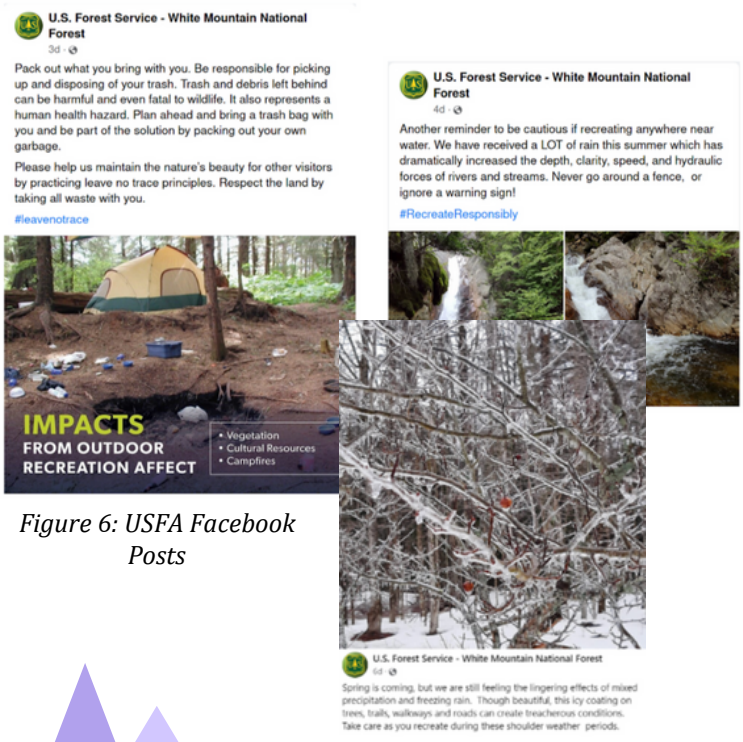

Figure 6: USFA Facebook Posts

Video Making

In order to create an effective marketing campaign using videos, we need to consider the structure and format of the video. The content of a video may resonate with viewers, but presenting it in an effective way can boost audience retention and impact. A major decision when deciding a video's structure is the choice between a narrative video and a non-narrative video. A narrative video is a video that tells a story and is not just purely informative. The choice made can greatly affect the impact of a video. For example, in 2022 a group of researchers in China wanted to explore how to increase people's willingness to protect the environment. The researchers found that subjects who watched videos with a narrative approach reported higher levels of immersion – they established a better connection to the media. The researchers also found that the audience's willingness to change behaviors and improve their environmental intentions increased after watching the videos (Zheng et al., 2022). In other words, a narrative approach to video making leads to higher audience engagement and immersion in the content of the video.

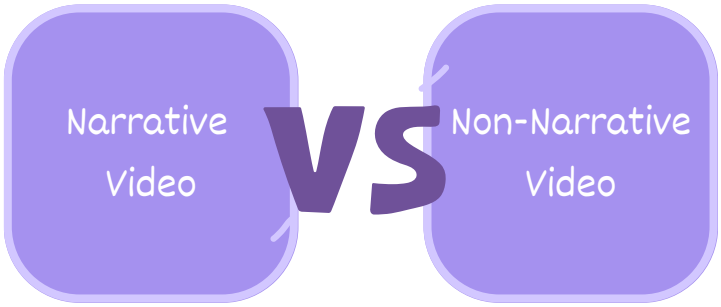

Figure 7: Narrative Videos vs. Non-Narrative Video

The same study found that viewing non-narrative videos also had a positive effect. Instead of targeting the audience's immersion and emotional connection, non-narrative videos target the audience's perception of environmental willingness in society. Viewing these non-narrative videos led participants to believe that being environmentally aware was a socially norm, leading participants to be more environmentally conscious (Zheng et al., 2022). Video structure is an essential aspect of video creation, but it is all a form of framing the content; underlying both content and structure is effective messaging.

Background

Effective Messaging

The next step after deciding how to structure the video is determining how to express the content. A 2020 study in the United Kingdom found that effective engagement campaigns for promoting biosecurity use the values and motivations of their target group to frame the issue and use sources trusted by their target group (Hall et al., 2020). Since avid recreationists enjoy nature, tying biosecurity to nature can increase participation. This is further backed up by another study from Japan, which explored how to best educate international students on earthquake survival strategies.

Figure 8: Franconia Falls Rapids

They found that "contents should be specific and appropriate for the international students and need to be presented based on their different knowledge and skill levels in a modest and convincing manner to feel the enthusiasm to learn from it." (Sagorika & Hasegawa, 2020). Another study from China had similar results, finding that leveraging an emotional connection, and therefore engrossing the audience, led to increased willingness to make more environmentally conscious decisions (Wang & Yue, 2022). In a 2017 article published by the Academy of Science of the Royal Society of Canada, scientists identified sixteen elements that can help create effective scientific communication. Of these elements, four are useful for the purposes of this research: 1) integrating communication into research, 2) diversifying content, and 3) enhancing research with communication (Cooke et al., 2017).

While some scientists may consider outreach a drain on time that could be spent furthering their work, integrating the two can save time and stoke interest in the audience. By sharing information with the public, scientists can encourage participation in citizen science. Citizen science is when members of the public voluntarily participate in some aspect of a research effort (MacPhail & Colla, 2020). This can vary from collecting and analyzing data to helping in conservation efforts. A diverse array of content maximizes accessibility and opens the door for many different groups to learn.

Once the right information is selected, presenting it in a clear manner is important to make sure that the desired audience retains and acts on the new information. For example, this means using the same language the audience uses to understand concepts, as well as framing the information in the same way that the audience uses to integrate these concepts into their mindsets. Tools for increasing comprehension include: presenting information with an intuitive, clear structure; using "adjunct aids" such as highlighting; showing what to expect before discussing it; summaries (Fischhoff et al., 1993).

A dramatic increase in visitation, search and rescues with preventable causes, and unintentional harm to the ecology of the forest are all growing concerns for our sponsor, Nicolette Keown, Lead Visitor Information Assistant Scientist with the United States Forest Service's White Mountain Visitor Center. Nicolette had us develop a marketing campaign to communicate information about recreating responsibly and safely. The Visitor Center plays a key role to White Mountain area visitors as it is often the first point of contact for recreators who are new to the WMNF. The White Mountain Forest Service has implemented numerous outreach programs; all experiencing varying degrees of success. Our goal for this project is to create educational videos that will be displayed in the Visitor Center to promote preparedness and environmental stewardship. We discuss our methodological approach to our project in the proceeding sections.

Methodology: Introduction

In our project, we assisted the United States Forest Service (USFS) White Mountain Visitor Center in educating visitors on forest safety and environmental stewardship. To achieve this, we created a series of short, informational videos that are displayed in the visitor center and posted on USFS social media. In order to meet this goal, we established the following objectives: 1) Prepare for video production; 2) Explore video topics provided by our sponsor 3) Develop videos using an interactive design process; and 4) Assess the effectiveness of video outreach. Though our methods present no risk to the participants, prior to distributing any surveys, or conducting interviews or focus groups, we got the informed consent of participants (see preambles, Appendix A). We elaborate on our pursuit of these five objectives in the following chapter.

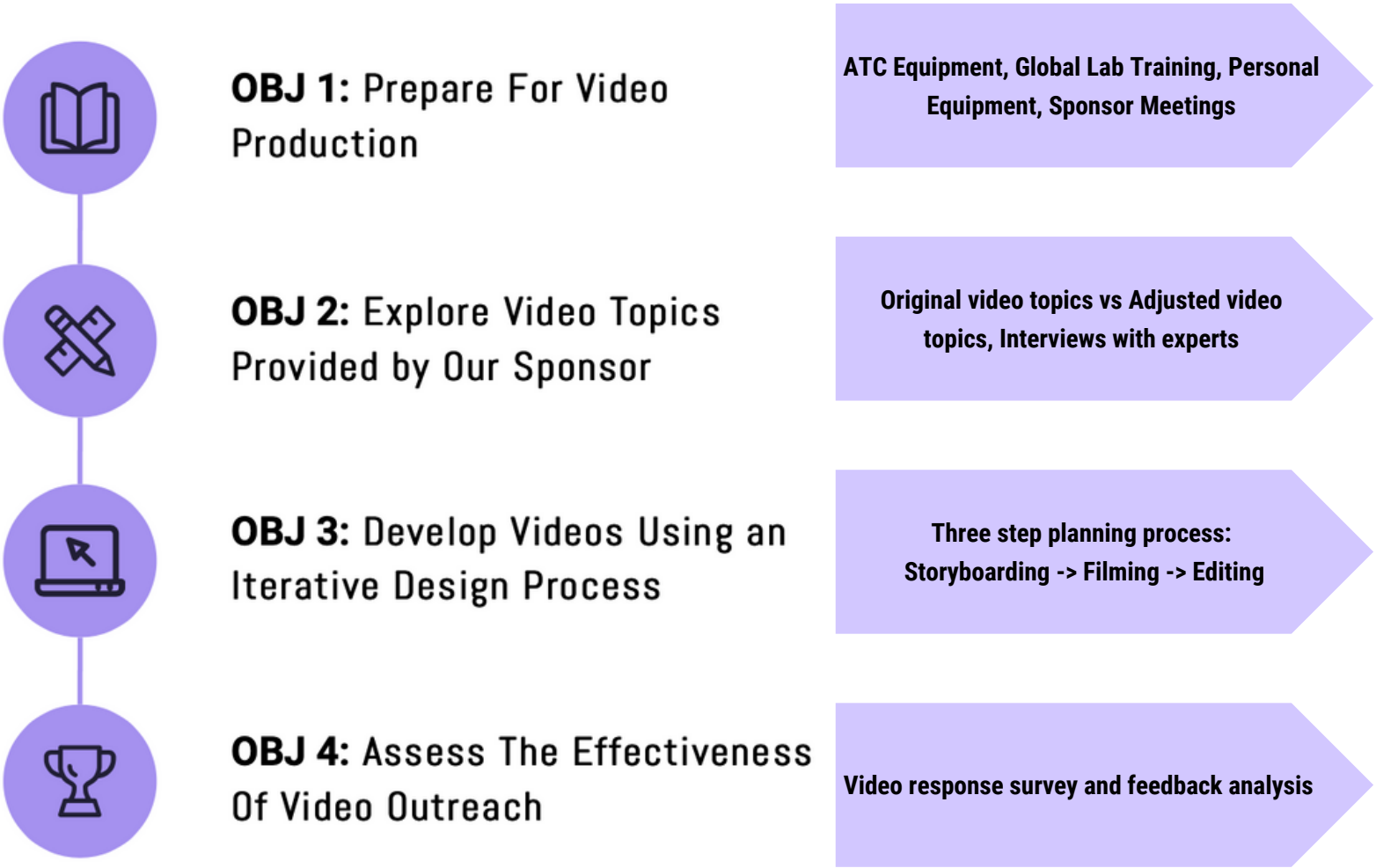

Figure 9: Methodological Approach

Methodology

OBJ 1: Prepare for Video Production

To prepare ourselves for the video making process, we met with James Monaco from WPI's Academic Technology Center (ATC) and his peers at the Global Lab to get guidance on video development. We also visited the ATC main office and borrowed three microphones from it for the duration of our project. We were able to provide a camera with various lenses, a microphone, and a gimbal (an electronic stabilizer).

Figure 10: Recording Equippment Used

Upon arrival in New Hampshire, we began recording B-Roll (supplemental or secondary video that plays intermittently to keep the viewer's attention) to have an excess of footage to provide us flexibility during editing. On August 28th we hiked Artist's Bluff, on September 1st we hiked Franconia Falls, and on September 6th we hiked Lady's Bathtub to collect B-roll. In an interview on August 29th, Nicolette Keown, our project sponsor, provided a list of video topics (water safety, hiker responsibility, volunteer program, bear awareness, backpacking, and fire safety). These topics were the basis for the videos we made.

OBJ 2: Explore Video Topics Suggested by Our Sponsor

To begin, we interviewed our sponsor, Nicolette Keown, Lead Visitor Services Information Assistant Scientist, and she provided strong insight on what the forest service needed and who we are going to be targeting our message towards. To better understand what types of media would work best for our target audience, we interviewed two experts in social media communication, marketing and USFS communication. These experts were able to help mold our rough and general ideas and structure the videos both in content and delivery.

Stakeholders and social media directors, of the WMNF and other closely related organizations, were reached out to in order to get a better idea of what posts do best and who the audience consists of (see interview preamble, Appendix B2). We used this data to aid in the design of our videos to maximize their effectiveness. The full list of interview questions can be found in Appendix C. These people included Nicolette Keown, our sponsor and Colleen Mainville, the WMNF Public Affairs Specialist.

We interviewed various experts for a better understanding of the ideas we needed to cover and begin planning our videos. We interviewed Nicolette Keown and Renee Plourde about hiker responsibility; Peter Thorne, Joan Marshall, and Chris Roukes for water safety; Ralph Perron for weather awareness; Brett Hillman; and Patrick Hill for wildlife safety.

OBJ 3: Develop Videos Using Iterative Design Process

To create the videos, we used a three step planning process: first we developed storyboards for each topic, next we filmed interviews and filler scenes, and then we edited the video. This process was based upon the information that we received from the interviews in the previous step.

Methodology

Once all the planning was complete we shot the footage. Many of the people we interviewed for information on the topics were reached out to again so that their expertise could lend credibility to our project (recorded interview questions are in Appendix D). We shot many of the scenes several times to ensure that we would have a good take to use when moving onto the next step; fortunately, our storyboards and scripts were detailed enough to make sure our group was not wasting time gathering unnecessary footage (Appendix E has each video script).

To complete our first set of videos we edited the clips together out of the footage we took, using only the best takes, and adding music and transitions to match the vision in the storyboards and scripts. We used Davinci Resolve software as our main editing tool.

These two minute videos were then shown to the Forest Service staff so that we could get feedback on them. We incorporated their advice into the videos and repeatedly checked it with them until it matched their expectations.

Figure 11: 3 Step Iterative Design Process

OBJ 4: Assess the Effectiveness of Our Outreach

We needed to assess audience understanding of the contents in our videos. This was critical to our methodological process since it allowed us to return to our video development and begin our iterative design process again. The importance here lies in our project group's intent to keep producing drafts that are better in quality, persuasive communication, and visuals.

Throughout the video development process, we shared each draft with our sponsor, Nicolette Keown, and project advisors Corey Dehner and Seth Tuler. While sharing snippets of progress we have been able to fix blatant formatting and structural issues as they appeared. For example, abiding by USFS branding requirements and the contents of the text we have on screen.

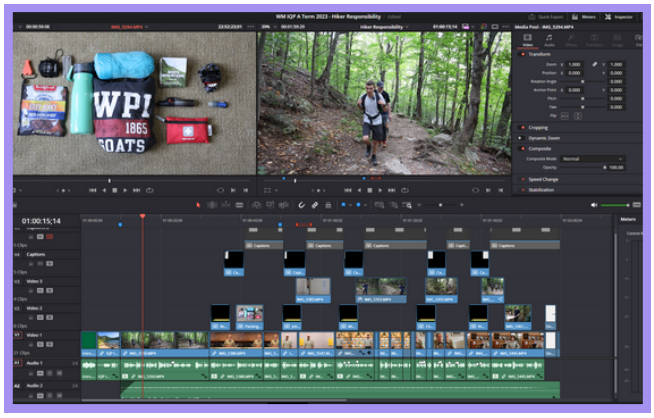

Figure 12: Screen Cap from DaVinci Resolve Software

After each video was drafted, we sought feedback from our peers in the form of a questionnaire to further improve our persuasive communication, our visuals, and overall quality of our deliverables. The participant pool for this questionnaire administration consists of our fellow students; their input is valuable for our project since it was timely and thoughtful. We prompted our viewers to participate in a 5-7 question quiz to gauge how much information they had already known or retained from the video we showed.

We also administered the same survey to a second pool of reviewers. Renee Plourde and Nicolette Keown of the White Mountains Visitor Center reached out to the Attractions Association, and they allowed our project team to approach visitors inside the Visitor Center and get real-time reactions from willing participants. Since the target demographic of the videos are recreators at the Visitor Center, this feedback was crucial to improving our deliverables. In a similar manner to the previous questionnaire, we prompted the participant with the video and requested completion of a 5-7 minute long survey. This data was collected on October 6th from 10:00am to 11:30am and we collected 12 survey responses in total between the *Hiker Responsibility*, *Water Safety*, and *Wildlife Safety* videos.

In addition to the recorded data we have on file from the digital survey, our group had taken observational notes on the behavior, physical reactions, and other noticeable occurrences from the visitor center data collection. All of these components will be analyzed and used to create better versions of each video shown. See Appendix F for the survey questions.

"White Mountains: Enjoy Your Hike!"

Findings: Introduction

Our project team developed *White Mountains: Enjoy Your Hike!*, a series of informative videos to encourage responsible recreation. This series consists of four videos: "Water Safety," "Hiker Responsibility," "Wildlife Safety," and "Leave No Trace." In addition, as part of the development of this video series we created a framework for designing educational videos that the United States Forest Service can share with visitors to the White Mountain National Forest (WMNF).

In this section we discuss the information from 14 interviews with various forest service staff and experts, 3 surveys, and WMNF visitation statistics that informed the design and final production of the videos. We organized our findings into 3 categories: 1) Prioritizing Video Topics; 2) Guidelines for Persuasive Communication Through Video; 3) Content of the Video Series; and 4) Testing Video Efficacy. We applied these findings to the design of the four videos in an attempt to improve visitor preparedness while recreating in the White Mountains.

Figure 13: Screen Cap from Opening Animation of All Videos

Prioritizing Video Topics

Our sponsor -- Nicolette Keown -- gives a credible account about visitor behaviors and population increase in *Figure 14*. Through interviews with Forest Service personnel and our personal observations, we have found that there is a large problem with uninformed and underprepared visitors in the WMNF, particularly during summer months.

"During late summer and early fall everyone wants to know when the foliage is going to peak. The White Mountain National Forest is known for its beautiful display of fall colors and visitors from all over the world travel here to see them. Visitors often don't realize how many other people have the same idea in mind and it's this time of year we see the most impact from day-use."

Figure 14: Quote from Our Sponsor: Nicolette Keown

Nicolette Keown, and other Forest Service staff, note that summer is when the most inexperienced visitors come to the WMNF and in turn, when the most instances of visitor unpreparedness occur. They relayed to us that visitors to the White Mountains are often unequipped to deal with the unique challenges that this forest poses. Visitors are also often not aware of many important environmental issues affecting the White Mountains. Many trails require crossing of rivers or streams, which can lead to visitors finding themselves stuck, unable to cross dangerous water. Many visitors lack knowledge regarding interacting with wildlife, and are frequently irresponsible with their food. Our personal observations about hiker preparedness are consistent with these observations by Forest Service staff. We observed hikers on 8 hikes: Artist's Bluff on August 28th; Cannon Mountain on August 29th, Franconia Falls on September 1st; Caps Ridge Trail on September 14th; Welch Dickey on September 21st; Franconia Brook Tentsite on September 8th and September 22nd; and Mount Willard on October 3rd. During these observations, we saw at least two people each hike who were visibly unprepared; they had improper footwear, lack of backpack or equipment in general, or a complete lack of wa hikes: Artist's Bluff on August 28th; Cannon Mountain on August 29th, Franconia Falls on September 1st; Caps Ridge Trail on September 14th; Welch Dickey on September 21st; Franconia Brook Tentsite on September 8th and September 22nd; and Mount Willard on October 3rd.

“White Mountains: Enjoy Your Hike!”

During these observations, we saw at least 2 people each hike who were visibly unprepared; they had improper footwear, lack of backpack or equipment in general, or a complete lack of water.

Guidelines for Persuasive Communication

While creating the videos, we used a set of best practice guidelines based on a review of relevant literature, interviews with experts, our training through WPI’s Global Lab, and our own prior experience with video production. Using what we learned, we created videos that persuade and engage visitors for the USFS. We define the efficacy of the videos to be how successfully the videos delivered their desired message, meaning how much viewers were able to retain the information in the video. In the making of these videos, we followed five guidelines to increase the audience’s ability to absorb the advice.

Offering safe alternatives and using positive language is more persuasive than using scare tactics. Colleen Mainville, Public Affairs Specialist for the WMNF, and Rachel Stoler, Community Health Program Manager for the Franklin County Regional Council of Governments, said that scare tactics do not lead to a significant change in visitor behavior. They instead said to offer alternatives to dangerous or harmful behavior.

In the same vein, completely forbidding an activity is not useful in changing behavior. Mainville and Stoler instead suggested harm reduction. Instead of asking visitors to stop doing something altogether, offer a safer alternative. For instance, suggest bringing a portable gas camp stove, as opposed to just telling visitors to not make campfires.

Language needs to be as non-technical as possible. Experts at the WMNF Visitor Center - including our sponsor Nicolette Keown, Chris Roukes, and Renee Plourde, Visitor Information Services Supervisor for the WMNF - explained that visitors to the WMNF often come with little to no knowledge of hiker responsibility and wilderness ethics. They suggested that an important strategy for educating these visitors is to use very little or no technical language.

We created the foundations of the videos using simple facts or observations, and then built on them to create complex warnings and instructions.

Videos need to be engaging. Consistent with our background research, Colleen Mainville and Rachel Stoler recommend writing videos with a narrative component that appeal to audience emotion. Our analysis of videos posted to the Adirondack Mountain Club Instagram account revealed a similar approach. We found that the most engaging videos used humor and had exciting visuals, music, and audio, to maintain viewer interest.

Video content must comply with USDA/USFS branding standards. These guidelines include restrictions on video length (2 minutes), the size, shape, and color of USFS and USDA logos, and format of intros and outros. These guidelines also included restrictions on the attire of Forest Service personnel in the videos, as well as how we were allowed to reference the USDA and USFS.

Videos must be consistent. In order to make sure that the videos are recognized as part of a possibly on-going series, we created an intro animation with accompanying music to be put in the beginning of each video. This helps differentiate the videos from other Forest Service videos.

SELECTED	CONSIDERED	RECCOMEND
Water Safety	Invisible Concerns	Volunteer Program
Hiker Responsibility	Higher Summit Weather	Backpacking
Leave No Trace	Camper Etiquette	Fire Safety
Wildlide Safety		

Table 1: Video Topics Generated; Organized by Use

"White Mountains: Enjoy Your Hike!"

Content Of Video Series

At the beginning of the project, our sponsor Nicolette Keown, Lead Visitor Services Information Assistant Scientist, gave us a list of six potential video topics relating to hiker preparedness and environmental stewardship. Through our communications with experts in the field we added new topics and removed others, and eventually selected and created the four video topics listed in *Table 1*.

Water Safety

Due to the high visitation during warmer months, May, June, July, and August, swimming areas tend to be very popular with recreators. The increased use of natural swimming areas is concerning to forest service staff, since unpredictable weather and flash flooding can lead to unsafe situations. Their concern inspired the goal of the *Water Safety* video, to educate the audience on appropriate water safety behaviors. USFS experts all shared a pressing concern about water safety due to the rapid weather changes in the region. According to our research on weather in the White Mountains, we know that this area is known for its intense and unpredictable weather conditions (*Mount Washington Observatory | Normals, Means, and Extremes | Mount Washington Observatory,* n.d.; *Hypothermia|Winter Weather*, n.d.).

Figure 15: Screen Cap from Water Safety Video

Chris Roukes, a visitor information frontliner with the USFS, stated that rivers in the White Mountains have a tendency to flood swiftly. He explained that water crossings that were safe to cross 24-48 hours earlier can suddenly become dangerous because of the temperamental weather causing spikes in the river's flow rates. Trailhead steward Peter Thorne supported this claim and shared that the trails around Franconia Falls used to be "railroad lines," which enhances the speed and direction of flood waters caused by storms that quickly reach the rivers. Roukes also emphasized that **knowledge is the most important resource hikers can have when dealing with these conditions**. For example, respecting the potential threat of a rapidly flowing river, and knowing safe river crossing techniques to help alleviate the risk of drowning and hypothermia due to frigid water temperatures.

Interviews with Lincoln Woods trailhead stewards Peter Thorne and Joan Marshall, as well as Chris Roukes, and our background research point to safe river crossing techniques, including: unbuckling and loosening backpack straps so that the hiker is not pulled down by their backpack if they fall, maintaining three points of contact with the river bed with hiking poles, and shuffling along the river bed so that your feet are always firmly planted on the ground.

Hiker Responsibility

The increase in visitors during the summer months means more people in the WMNF area and on its trails, summits, and campgrounds. Unfortunately, many of these visitors are not aware of how to be responsible for themselves when it comes to protecting both themselves and the surrounding environment.

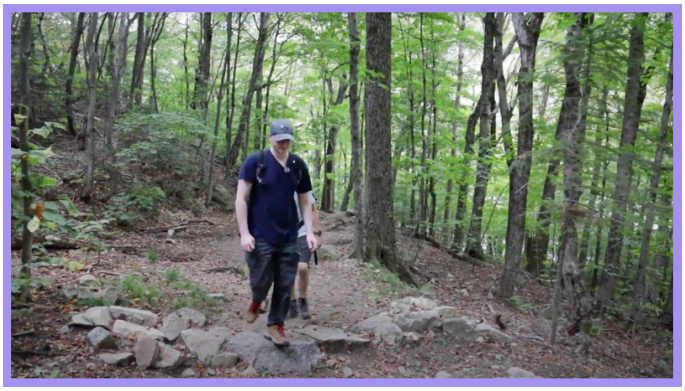

Figure 16: Screen Cap from Hiker Responsibility Video

"White Mountains: Enjoy Your Hike!"

The goal of this video is to highlight the importance of personal responsibility when hiking in the area. Visitor unawareness continues to be an issue regardless of how accessible the Forest Service has made this information – the White Mountains Visitor Center and the White Mountain National Forest Headquarters provide informational pamphlets on the "HikeSafe" codes, yet the message is missed by too many visitors. These principles are widely promoted to White Mountains recreators; our team further believed this after volunteering for the forest service and receiving participatory shirts with the HikeSafe code displayed largely on the back. However, many visitors still lack the knowledge it provides. We know this to be true because of the accounts and observations from the forest staff in the Visitor Center and White Mountain National Forest Headquarters. These specific accounts are from: Nicollete Keown, Renee Plourde, Chris Roukes, and Brett Hillman.

The 10 Essentials:

- **Map**
- **Compass**
- **Warm clothing**
- **Extra water**
- **Extra food**
- **Rain jacket**
- **Fire starter**
- **Flashlight/headlamp**
- **First aid kit**
- **Knife**

HikeSafe Code

Be prepared:

1. **With knowledge and gear**
2. **To leave plans**
3. **To stay together**
4. **To turn back**
5. **For emergencies**
6. **To share the code**

Figure 17: List of 10 Essentials and HikeSafe Code

Being a responsible hiker involves bringing the Ten Essentials and following the HikeSafe Hiker Responsibility Code. This code consists of six principles meant to reinforce personal responsibility among outdoor recreators. We gathered much of the information on these principles from the HikeSafe website (*https://hikesafe.com/the-code*), HikeSafe is an organization created by the USFS and NH Fish and Game that developed the six principles, as well as from talking to staff in the White Mountains Visitor Center.

Additionally, we determined which principles to stress in the videos by talking to USFS staff, namely Nicolette Keown. Through discussion with Forest Service personnel, we learned that the Ten Essentials are another component of hiker responsibility and preparedness that often goes overlooked as well, so we include a description of the Ten Essentials in the video. This further reinforces the points made by Mason et al. (2013) and Daniel et al. (2021) about the importance of carrying the Ten Essentials whenever you hike.

Wildlife Safety

Many visitors have little previous knowledge or inhibition when it comes to interacting with and/or attempting to photograph wildlife. The goal of this video is to encourage visitor accountability and responsibility in wildlife interactions, which are common in the WMNF region. Brett Hillman, a wildlife biologist for the WMNF, shared stories where people would walk up to moose or bears thinking they can get a good photo or be able to pet them. In the best case scenario, the animal simply runs away. In the worst case, people are injured. Hillman explained that this type of interaction can be even more dangerous if people approach animals that are with their cubs or calves or are in the midst of mating season when they can be particularly aggressive. Unfortunately, people are not widely aware of these details. Due to the popularity of the WMNF, local wildlife, including squirrels, chipmunks, etc, are commonly adapted to the presence of humans, and are more likely to approach visitors and campsites.

Figure 18: Screen Cap from Wilflife Safety Video

This makes visitor responsibility even more crucial, as when a negative interaction occurs between visitors and wildlife, the wildlife are typically the ones who suffer the worst. Even when visitors are aware of appropriate behavior with regard to wildlife, they may misuse or misunderstand how to implement preventative measures. Patrick Hill, caretaker of Franconia Brook tentsite, explained that he has observed bear boxes (as seen in Figure X) left open or with trash left inside, defeating their purpose. The trash also takes up space in the bear box that other campers need. The bear hang, a technique used to keep food off the ground and away from bears, is discouraged by both Patrick Hill and Brett Hillman, both because visitors often don't have the equipment or technical skill to use them correctly and because the forests in this area of the country are too dense for it to be effective. Both Hillman and Hill explained that because black bears in the WMNF are very capable at climbing trees, and due to the density of trees in the WMNF, bears are able to climb nearby trees to access bear hangs. One resource that most of the interviewed forest service workers mentioned that is underutilized is the bear canister program. This program provides bear-proof food containers, for free, that hikers can check out and return from the Visitor Center in Lincoln, NH, or the WMNF Forest Headquarters in Campton, NH.

Leave No Trace

The United States Forest Service has historically promoted "Leave No Trace" principles to visitors of National Forest land. There are informational pamphlets in the White Mountains Visitor Center and the White Mountains National Forest Headquarters. We have found that although the "Leave No Trace" principles are wildly accessible and heavily promoted, a large number of visitors, especially during the busy summer season, miss these promotions altogether. The goal of this video is to introduce unaware viewers to the "Leave No Trace" principles in a less formal manner.

These principles were emphasized by our sponsor, Nicolette Keown; Erik Samia and Nora Sackett from the Appalachian Mountains Club; and our background research about being friendly towards the environment and limiting the impact on wildlife and the surrounding nature (Wu et al., 2021).

Figure 19: Screen Cap from Leave No Trace Video

The video follows a group of hikers along a trail as three of the hikers stumble across various teaching moments and capitalize on them. For example, a member of the hiking party finds a flower and goes to pick it, only to be stopped by one of his fellow hikers. Then, the experienced hiker continues to briefly elaborate on why he should "take nothing but pictures, and leave nothing but footprints." This video speaks to each of the "Leave No Trace" principles in this manner.

Testing Video Efficacy

Furthermore, while employing these strategies, we were able to develop various findings and come to conclusions about effective communication strategies that were relevant to our project and realistic to implement. The conclusions are explained in the following section.

Once we created the videos and collected feedback using a survey, we synthesized the responses and identified video strengths and weaknesses. Using this data, we reworked the videos and sought additional feedback. For example, *Table 2* lists types of responses our project team received on the *Water Safety* video from 14 survey respondents. We asked viewers questions about video content and enjoyment (see Appendix F1 for complete survey). Using *Table 2*, and feedback from the Forest Service Creative Services Team, we revised parts of the video, including: replacing the clip of a member of this research team explaining the components of water safety. We adjusted the volume and made it uniform throughout the videos and changed the style of the text appearing on screen.

Water Safety Survey (n=14)

Q1: Can you list as many tips as you remember about safe river crossing?				
Water must be below knee level	Loosen bag straps	Cross river diagonally, against the current	Shuffle/don't cross legs	Brown water = too rapid!
Q2: What do you think is the most important takeaway from the video?				
Safe river crossing	Water/ weather preparedness	Unbuckling straps when crossing		
Q3: What aspect of the video stood out most? Was it positive or negative? (Music, dialogue, animation, imagery, etc)				
River crossing demo/tips	USFS employee inclusion	Rapids B-Roll	Intro animation	
Q4: Was there anything that was confusing to you? Why?				
No	Awkward transition between speakers			
Q5: Do you wish there was more information/detail about anything in the video?				
No	Weather	More river crossing dangers		
Q6: Did any part of the video make you smile or laugh? If so, when?				
Beginning animation	Ellys' acting	No		
Q7: On a scale from 1-10, how interested were you with this video?				
9	8	7	6	

Table 2: Synthesis Table of *Water Safety* Survey Feedback

Recommendations

We completed four videos that address methods for improving visitor preparedness and environmental stewardships in the WMNF. While developing the videos we identified additional opportunities that the WMNF can consider to further support efforts.

We recommend that the WMNF visitor services develop a video called *Invisible Concerns.* "Invisible concerns" in this context refers to issues that affect visitors that they are often unaware of entirely.The concept was "invisible concerns" in the White Mountains including, weather, air quality, and trail erosion. We created a storyboard for this video, but due to time constraints were unable to complete it. We recommend that this storyboard be used as a basis for a future video. Similar to the storyboard, we shared a recorded interview with Ralph Perron, Regional Air Quality Specialist, that could be used in the future as part of a video on air quality or higher summits.

In a similar vein, we recommend developing a second video concerning wildlife safety. After creating the first wildlife safety video, we had another video's worth of footage and information from Brett Hillman. We believe that spending the time to edit an additional video about what to do if you encounter a bear or moose would be well worth the Forest Service's time and would help further educate visitors about wildlife safety.

We recommend that the WMNF Forest Service expand their social media presence to YouTube and Instagram. A problem we ran into while trying to plan out how the videos would be distributed was reaching out to different demographics. The only social media that the White Mountain Visitor Center has is X (formerly known as Twitter) and Facebook. A dedicated WMNF account on Instagram or YouTube would also allow the White Mountain social media tema to have more freedom in posting and access to new demographics.

In addition to social media platforms, we recommend the White Mountains Visitor Center share the videos with other WMNF buildings. Specifically, we recommend sharing the videos with: Saco Ranger Station, White Mountains National Forest Headquarters, and any other forest service building open to recreators.

We recommend having longer, more in depth videos that could be played in the visitor center with a shorter version that could be posted on the official Twitter or Facebook. At times the format of the videos, limited to exactly two minutes or under, felt stifling. This is a government guideline that exists solely for social media.

We recommend the White Mountain Visitor Center staff survey audiences about the video messaging, so that the White Mountain Visitor Center can continue to assess the effectiveness of the videos and use the information to refine future videos. This can mean surveying in the Visitor Center or posting on social media and seeing which video has the most positive response, likes, shares, or views.

Ultimately, we believe that visitors who come to the White Mountain National Forest have good intentions. Visitors do not mean to cause harm by stepping off trail or getting lost and needing to be rescued. The goal of our project was to help inform visitors so they can be more self-sufficient and mindful of their surroundings. These videos will not eliminate the problems caused by novice visitors, but hopefully they can help alleviate it and allow the Forest Service to put more resources into keeping the forest beautiful and open to all.

Figure 20: First 6 Panels of Invisible Concerns Storyboard

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