

Bar Harbor Project Center

Trail View: Acadia National Park

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Student Authors:
Stephanie Fariello
Fernando Gonzalez
Caitlyn Marcoux
Luke Pantuosco

Project Advisor:
Professor Frederick Bianchi

Project Sponsor:
Dr. Abraham Miller-Rushing, Schoodic Education and Research Center

Acknowledgments:
Kristina Rugg

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Abstract:

As the world continues to utilize the new technologies available, so too does the National Park Service (NPS.) WPI Trail View was created to assist the National Park Service connect people to parks by documenting the hiking trails at Acadia National Park. Trail View creates virtual tours of the trails and houses them on a website that can be accessed through the Acadia National Park website. The website has been expanded to include educational information such as maps, flora, fauna, and a photo gallery of each trail in the park. Trail View offers a way for people who can't visit the trails to still experience them. The project is meant to raise interest in the National Parks (specifically Acadia) and educate people on the issues important to the NPS.

Executive Summary:

The National Park Service has been dedicated to preserving America's parks for almost one hundred years. In this time the NPS has acquired 84 million acres of land in U.S. states and territories; expanded its mission to include not just parks but also historic sites, recreational areas, and monuments; and continued to share beauty and wonder with the public. The NPS has accomplished much, but as it prepares to enter its second century of civic duty the NPS opts to look to the future and not relish in the past. The National Park Service recently released, "A Call to Action." A set of 36 goals the NPS believes will enhance park experience as well as take advantage of the new technologies available to spread its mission to everyone.

Consistent with this progressive mentality, the WPI Trail View was created in 2012. Trail View is a project that documents trails in Acadia National Park by making them into virtual tours, similar to Google's documentation of roads in their Street View. Virtual tours are created by linking together panoramic pictures. Panoramic pictures are different in that they capture a full 360 by 180 degree image. When viewed in the right program these panoramic pictures create a spherical image of the surroundings (or photosphere.) These panoramas are beneficial in virtual tours because they give the viewer a first person view in all directions, creating a more genuine and interactive experience.

The previous two years of WPI Trail View served mainly as proof of concept that the feat was possible. The 2014 Trail View team aimed to expand the task at hand by also creating a website to house the tours and information about all other Acadia trails. The website would then be implemented by Acadia.

Creating the website to go along with the tours better addresses the three "Call to Action" points the group is focusing on. Action point 4: In My Backyard, looks to increase access to the outdoors in urban areas. Action point 17: Go Digital, aims to enhance the online park experience and improve connections to the park via the internet. Action point 19: Out with the Old, reads, "Engage national park visitors with interpretive media that offer interactive experiences, convey information based on current scholarship, and are accessible to the broadest range of the public. To that end we will replace 2,500 outdated, inaccurate, and substandard interpretive exhibits, signs, films, and other media with innovative, immersive, fully accessible, and learner-centered experiences." The WPI Trail View addresses all of these. The tours capture the beauty the park has to offer and will eventually be implemented into Acadia's site. Once they are online they will serve as a way to connect people to the park. The tours reach out to those who have no means of physically hiking them. The website was created to add an educational and organizational value because it would house not just the tours but additional information. Increasing the knowledge readily available to the viewer will increase the understanding of not just the trails but also the park and the life in it. The website will eventually replace Acadia's current trails page, which has minimal information about the trails in the park.

The 2014 WPI Trail View team successfully documented Gorge Path and Dorr Mountain North Ridge Trail. Using a 5th generation Ipod touch and an app called 360 Panorama the team took 223 panoramic pictures along the 1.8 mile Gorge Path, and 141 panoramic pictures along the .9 mile Dorr North Ridge Trail. GPS coordinates were taken at each photo location. The team also took still pictures of flora, fauna, and other interesting spots to add to the website. In order to create the final virtual tours the group used Panotour 2.1 (Kolor, 2014). Panotour allowed the team to take the panoramic pictures off the Ipod, link them together to make the tour,

and view the tour afterward. The final tours came out very well. They were easy to navigate, fluid, and each panorama transitioned to the next smoothly. The scenery looked exquisite, even in the panoramas. The team definitely was successful in capturing the beauty of the trails.

The Trail View team was also successful in developing a website prototype for Acadia to use. The website features all the trails in the park, ranging from easy to moderate to strenuous. In addition to housing the virtual tours it also displays: a map of the trail, description of the terrain, flora, fauna, observations, points of interest, history, trail audio, and statistics such as distance, elevation change, difficulty, and estimated completion time. The site came out very easy to navigate. By putting all of the information collected on the same page it reduced the number of tabs and dropdown menus needed in the layout. This makes it possible to link to any given page no matter where the viewer is on the website. The site was created using a local server and housed on a single computer, so it has not gone live on the internet. However, Acadia has received the website templates and the site is ready to be implemented.

The future of the Trail View project is very bright. With new panoramic photography technology being developed every year the trails will become easier to document. The website design is complete and future Trail View teams need only to fill out the information on the rest of the trails. The website even could incorporate elements from other Bar Harbor IQPs, such as Sound Archive and Dark Sky. The future of Acadia National Park is also benefited by Trail View. Should the website be implemented by Acadia National Park it could soon be a hotspot for citizen scientists, eager to add their data and experiences to the site. The tours on the website will allow people all over the country to appreciate the nature of Acadia and spread accessibility to the Park features.

Authorship

Abstract: Caitlyn

Executive Summary: Luke

Introduction: Caitlyn, Fernando, Luke, Stephanie

Background: Caitlyn, Fernando, Luke, Stephanie

Methodology: Caitlyn, Fernando, Luke, Stephanie

Results: Caitlyn, Fernando, Luke, Stephanie

Recommendations: Caitlyn, Luke

Conclusions: Stephanie

Works Cited: Stephanie

Appendix: Caitlyn

Editor: Luke

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Chapter 1: Introduction

The National Park Service (NPS), established in 1916 by President Woodrow Wilson, is one of America's foremost organizations to protect the nation's natural heritage and make it accessible to the public. As 2016 and its 100th year anniversary approaches, the National Park Service has issued, "A Call to Action." This plan lists four areas that the NPS believes will enhance park experience: one, connecting people to parks, two, advancing the NPS education mission, three, preserving America's special places, and four, enhancing professional and organizational excellence. Amongst these four categories are a total of 36 points the NPS looks to accomplish.

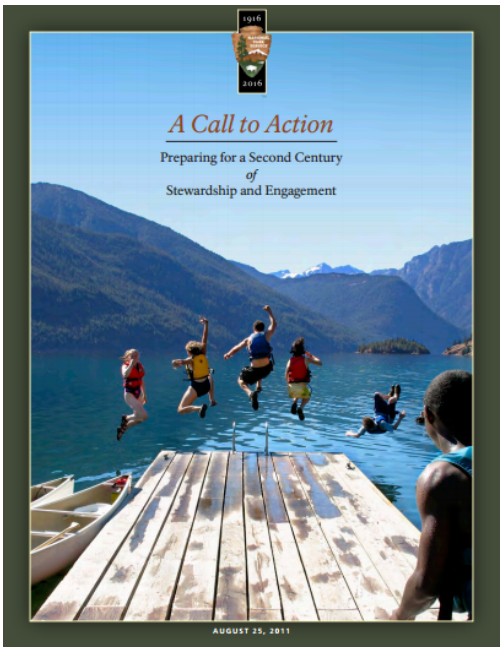


Figure 1: Acadia's "A Call to Action" plan

To fulfill these objectives, parks are establishing more trails for people to walk as well as expanding water-based recreation such as kayaking trails and bathing areas. Taken together

these help improve the on-site visitor experience. Specifically, the trails are more accessible yet retain their exquisite beauty and tranquility. This is important to keep a balance between humans and nature. Furthermore, the trails allow interaction with nature whilst keeping people within a boundary to protect plant and animal life from harm. The trails at Acadia National Park are a significant attraction and walking these trails is an important means to achieve this objective.

Unfortunately, accessibility to the park is only available to those who live nearby or who are able to travel to Acadia. Other people cannot experience the beauty and serenity. It would be beneficial to create another way to view the park.

One solution is to create virtual tours of the park trails. Twenty-first century technology has made it possible to compile panoramic pictures that allow the viewer to get an almost on-site experience; the only necessary instrument is a computer with internet access. This technology can be implemented to help the NPS by using multiple panoramic pictures to create a virtual trail. The tours would let the public view the park trails without having to be there. Not only would this open up the park for everyone to see, but would also limit the negative impact that humans have on the park.

Chapter 2: Literature Review

Over the past few hundred years there has been a steady increase of interest in national parks. More people are excited to learn about them now than ever before, often via the internet. Fortunately, modern technology allows for a large scale distribution of information and images to viewers worldwide. Many parks across the nation, including Acadia, are currently expanding their reach with the use of the internet. This makes it easier for national parks to distribute their information to anyone who wants it. Educational tours, literary resources and virtual tours are popular distribution methods.

2.1: National Parks:

The National Park Service remains committed to its original mission, "maintaining and protecting our national parks (NPS) for the continued benefit and enjoyment of all Americans" (United States. National Parks Service, 2014). There is a struggle, however, to preserve the natural beauty of the parks while letting the public enjoy them without harming the environment. In order to better serve future generations, parks like Acadia are looking to implement new ideas.

2.2: Acadia National Park:

Acadia National Park is the first eastern National park, but with only 45,000 acres it is also one of the smallest National parks. Nevertheless it is home to a variety of animals, ranging from lobsters to black bears. While the park addresses its mission to protect nature it also serves

as a popular place to visit. Acadia is the first point in the U.S. the sun hits in the morning, and its rugged Maine coastline is one of a kind. The park provides outdoor activities for any season and for any age such as hiking, guided tours, and snowshoeing. The views at Acadia are breathtaking and the surrounding sounds from the animals and crashing of waves add to Acadia's charm (United States. National Parks Service, 2014).

2.3: Cyber Technology in Parks:

Modern technology can be used to display the beauty of national parks. Internet resources are used for promotional purposes, educational purposes, cyber tourism and advertisements. Thousands of Americans are geographically or physically incapable of visiting national parks. For them, cyber tourism is a superb alternative. Cyber tourism can be defined as the application of technology, such as geographical application of tools, graphic instruments and simulations, to achieve a tourist like experience (Glenn F. 2005). One of the best examples of cyber tourism is the use of virtual tours such as the Nature Valley Trail View (United States. National Parks Service). These tours address accessibility challenges and have increased the overall interest in national parks. Online projects like this allow people who cannot visit the parks in person another way to connect to nature.

The NPS's Call to Action initiative aims to take full advantage of the new resources at its disposal. Since so many people have access to the internet the NPS has decided to use it as an educational tool. This can be seen on their websites. Websites offer a variety of features that can be used to achieve this educational purpose. Interactive games, for example, can teach children how parks can be fun and how to preserve them. For more academic purposes most

park sites contain pages with video lectures, scholarly articles, and park podcasts. All these are methods of cyber tourism and their implementation has greatly increased interest in the parks.

2.3.1: Internet Usability:

In order to meet this demand, websites need to be designed with the user in mind. A website with virtual tours must be easy to use. To accomplish this, there are five concepts a web designer must keep in mind: learnability, efficiency, memorability, errors, and satisfaction. In other words, websites should be easy to learn, efficient to use, easy to remember, have few errors, and pleasant to use (Nielsen, 1994). The website that the trail view team presents to the viewer must follow these principles.

2.4: Panoramic Pictures:

The best pictures to use for a virtual tour are panoramic pictures. The term panoramic picture, referring to a wide-angle space, first originated when Robert Baker painted a large swath of Edinburgh, Scotland and displayed it in one painting (Lippman. et al.). Today the term Panorama is more associated with photography.



Figure 2: Early panorama of London by Robert Baker

Panoramic photos are not a new technology, but are being used in new ways. When the camera was first invented panoramas were used primarily by the military to survey the land

("Panoramic Photographs - a Brief History", 2013). With the development of cameras specifically made for taking panoramic pictures, panoramas have become more recreational. Panoramic pictures can now be used to share areas of the world others cannot visit.

2.5: Virtual Tour Viewers:

Panoramic pictures are only the first step to make virtual tours available to the public. The next step is to display the pictures in a virtual tour viewer. Virtual tour viewers are the result of the pursuit of photorealistic imagery (Debevec, 1999). A tour uses a series of panoramic pictures that can be layered one on top of another. In these viewers the user can seamlessly travel from one picture to another as if physically walking through the area itself. There are many programs to create virtual tours. Each program is slightly different in what it offers but all can be incorporated into a website. New advancements in the technology of virtual viewers are incorporated in newer programs. These state of the art viewers can be seen in Google street view and the Nature Valley Trail View projects.

2.6: Examples of Tours:

2.6.1: Google World Wonders Project:

Google has always been a leader in cyber tourism. Google street view is the standard to which all subsequent virtual tours are compared. Google has even teamed up with other partners to help create projects like the Nature Valley Trail View. Their most recent undertaking, the Google World Wonders Project, started with a simple goal; to bring the wondrous places of the world to a site where they can be easily accessed: the internet. For example, most people won't

have the opportunity to visit the Leaning Tower of Pisa or the Eiffel Tower. Now they can. Furthermore Google has incorporated historical facts about each of the sites in their virtual tours. This makes it educational as well as easy to navigate. (Google, 2014).

2.6.2: Nature Valley Trail View:

In 2011 the Nature Valley Company partnered with the National Parks Conservation Association to create the Nature Valley Trail View. Utilizing the same street view technology that Google uses, Nature Valley created virtual tours of four National Parks: Sequoia, the Grand Canyon, Great Smokies, and Yellowstone. Among the four over 400 miles of trails have been documented. Nature Valley also provides useful information about several additional national parks, including some there are not yet tours of. Nature Valley describes the preservation efforts of these parks and the steps taken to reach these goals. The goal of this project is very similar to the goals of the WPI Trail View team. (Nature Valley, 2014).

2.7: Supporters:

The Nature Valley project wouldn't be possible without the help of supporters like Google. Similarly, the Trail View team can use the help of key supporters at Acadia including the SERC Institute and Friends of Acadia.

2.7.1: SERC Institute:

The Schoodic Education and Research Center (SERC), located in Winter Harbor, Maine works hand in hand with Acadia National Park. SERC has raised money for research projects

and supported many educational opportunities at the park. Established in 2004, the Schoodic Institute is the largest of nineteen other research learning institutes in the United States. The main goal of SERC is to create a better visitor experience for Acadia. In this way it hopes to build a public appreciation of the park and all it has to offer. (Schoodic Institute, 2014).

2.7.2: Friends of Acadia:

Another group that aids in the protection and preservation of Acadia is Friends of Acadia. Friends of Acadia is a non-profit organization that is committed to "work[ing] with Acadia National Park to identify resources that are negatively impacted by [the increase] in park visitation" (Friends of Acadia, 2014). To accomplish their mission they have "...develop[ed] innovative and long-term approaches to [subdue] these impacts" (Friends of Acadia, 2014). Friends of Acadia has aided in the restoration of the trails at Acadia, and they will be called upon to support the proposed effort.

Chapter 3: Methodology

The 2014 Trail View team has produced an online viewer so the public can see trails of Acadia from their homes. The team put pictures into a panoramic viewer to re-create the trails and embed the trails into a website. Before this could be accomplished, the equipment, trails and software had to be determined. Criteria had to be followed in order to meet the necessary specifications. Together these have been used to create a trail view of the Acadia National Park trails.

3.1: Equipment Selection:

Equipment selection employed several criterion. The camera had to be capable of taking high quality pictures. A portable GPS system was needed to pinpoint the location of photos taken on the trails. The trail had to be visually appealing and was chosen based on qualities such as popularity, sunlight, etc. Lastly the software selected had to be capable of effectively stitching photos and creating a virtual tour.

3.1.1: Camera Selection:

An appropriate camera needed to be selected. It did not need to be powerful since the stitching software only takes around 600kb panoramic pictures. Any camera with a good resolution, more than three megapixels, would suffice. The iPod 5's five megapixel camera met this requirement and was the most simple and convenient camera to use. It was also chosen because of its operating system and software availability. Due to the irregular terrain of the trails a tripod along with an iPod mount was used to stabilize the iPod.



Figure 3: Used five megapixel camera on fifth generation iPod



Figure 4: Tripod setup used, with the iPod mounted

3.1.2: GPS:

Sites along the trails at Acadia were photographed to create the trail view. The specific location of these sites were recorded by a portable GPS and displayed in each photo of the virtual tour. This made the trail view more accurate and thus a more genuine experience.



Figure 5: Garmin e-Trex GPS used

3.1.3: Trail Selection:

Acadia National Park has over 120 miles of hiking trails. The trails vary in difficulty. Some are easy while others are strenuous. Each trail leads to different attractions and some network with the Carriage Roads.

Not all trails, however, were recorded. The following criteria determined what trails would be documented. First there are the trails that are most popular. By consulting park staff the team was able to determine which trails are hiked the most by visitors. Second was the accessibility of the trails. The trails had to be easily accessed by the team and the equipment needed to take the photos. Third was the level of difficulty of the trail. Cooperation of park officials and hikers at Acadia National Park also helped to decide which trails were chosen.

The group decided to focus on documenting a network of trails known as the Gorge Loop Path. The Gorge Loop Path is not only a popular hiking attraction but also showcases the exquisite stonework of Acadia, offers fantastic views from the summit of Dorr Mountain, and is historically significant. The path consists of 6 separate trails: Gorge Path, A. Murray Young Path, Dorr South Ridge Trail, Dorr North Ridge Trail, and segments of Hemlock Trail and Canon Brook Trail. Due to time constraints the team knew they would not complete the path, but agreed it was important to begin.

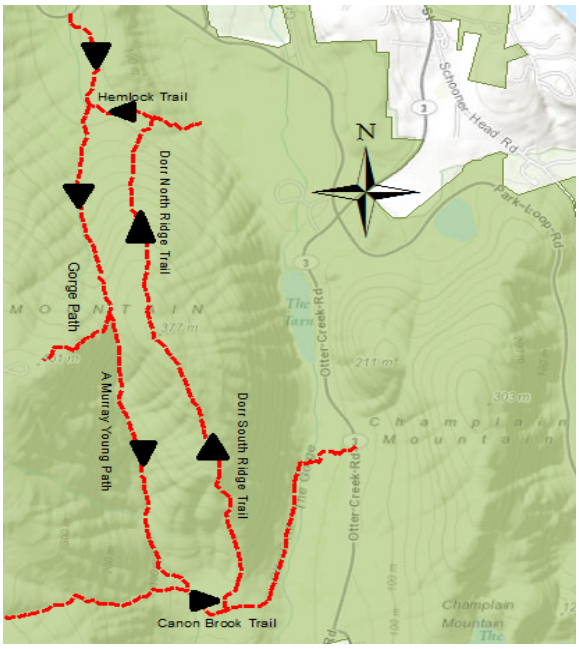


Figure 6: Gorge Loop Path and the trails that comprise it

3.1.4: Software:

Several types of software were needed. Three software solutions were used. 360 Panorama application for the iPod has the capacity to take photos while also stitching the pictures into a photosphere. Panotour, by Kolor, loaded each photosphere into a virtual tour

creator and created the trail view tour. A website made with Wordpress was used to house the completed tours.

3.1.4.1: Panorama Creation:

Most mobile operating systems offer a great variety of apps. 360 Panorama by Occipital stitches pictures automatically while being taken to create a panorama in one fluid motion. This created a file quickly that was high quality, easy to achieve, and ready to be implemented in the touring software.



Figure 7: Flat panorama of Dean Street, as seen in a 2 dimensional view, created with the 360 Panorama app

3.1.4.2: Panorama Reduction:

Once the panoramas were gathered the size was then reduced for optimal usability for the website and for the Panotour. This allowed maximum number of pictures to be loaded into Panotour without the software crashing.

3.1.4.3: Virtual Tour Creator:

Panotour is an application made by Kolor that creates interactive 360-degree virtual tours. Each panoramic photosphere was loaded into Panotour's editor to create the tour. The pictures were then reorganized into a streamline path. Arrows were added to allow smooth transitions to the next photo when clicked. Other items were added such as menus, thumbnails, hotspots, and transitions. When finished, the tours were built and embedded into a website.

3.1.4.4: Website:

The trail view team used Wordpress to create the website design. The purpose of the site was not only to host the virtual tours created but also to act as a template or prototype for Acadia to expand their online trail information. To fulfill this the team created a separate page for each trail and provided details such as: trail name, length, elevation change, terrain description, expected completion time, fluora, fauna, historical information, virtual tour, and a map of the trail for each trail in the park.

3.2: Taking Panoramas:

A small virtual tour of the College of the Atlantic was made first. This allowed room for testing the equipment and techniques before tackling more difficult trails. Pictures were gathered on clear sunny days to enhance the viewer experience**.** When this was accomplished the team was able to document the Acadia trails with practice and confidence.

Determining the number of pictures for each trail and where exactly to take them was critical. Different angles showcased the beauty and uniqueness of each trail. The number of pictures affected the realism of the trail view. Another key factor was the curvature of the trails.

The team always made sure the spot of the past photo was visible before taking another panorama. This improved the fluidity of the virtual tour.

3.3: Gathering Information:

Qualitative methods were used to gather data. A case study was conducted of past view projects in order to make ours functional and inviting. Park rangers, park visitors, and our sponsors were interviewed to determine what educational information should be included in our final trail view.

Chapter 4: Results

The 2014 WPI Trail View team was successful in completing two virtual tours and creating an interactive website. The website hosts the tours and relevant information about the trails, including pictures and observations the team made while documenting the trails.

4.1: Trail Selection

Before arriving the team chose, with the help of park staff, to document the Gorge Loop Path. The Gorge Loop Path is made up of 6 different trails: Gorge Path, A. Murray Young Path, Dorr North Ridge Trail, Dorr South Ridge Trail, and segments of Hemlock Trail and Canon Brook Trail. Due to time restraints the team knew they wouldn't be able to document all of the Gorge Loop. Because of this, the team needed to determine which parts of the Loop to focus on.

Ultimately Gorge Path and Dorr North Ridge Trail were the trails the team chose. Gorge Path is one of the most popular and unique trails in the park because it journeys through the narrow, rocky valley between Dorr Mountain and Cadillac Mountain. The team picked Dorr Mountain because they believed the vast, open views would contrast those of Gorge Path. Having tours of two different terrains gives the viewer more variety. Future teams will add onto the tour by completing the remaining trails in the Gorge Loop Path.

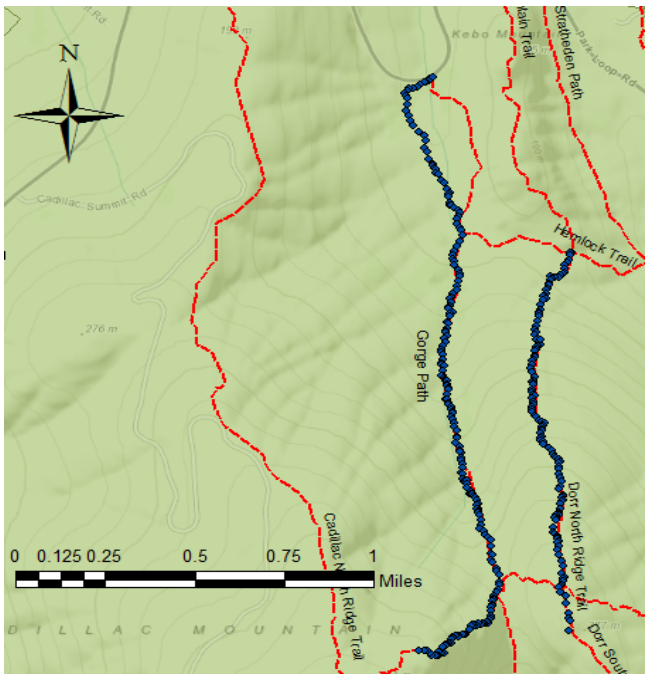


Figure 8: Map made in ArcGIS program of each panorama taken based on GPS coordinates. Each blue dot is a picture the team took.

4.2 Panoramas

Once the trails were decided upon the team hiked and documented both of them. The team took high quality panoramas on clear sunny days for clear views of the trail. Each picture was taken facing a bright area first. This allowed the camera to adjust to the light and reduced sun glare in the photos.



Figure 9: Adjusting to the light to reduce sun glare was essential, especially on Dorr Mountain

Each panorama was taken within view of the last picture to improve fluidity of the final virtual tour. Distance between pictures varied based on the curvature and elevation change of the trail. While panoramas were being taken one team member used a Cannon camera to capture still photographs of plants, animals, and beautiful aspects along the trail. GPS points were taken at every location a panorama was taken. After each trail was documented a total of 360 panoramic pictures had been captured.

4.2.1: Determining Optimal Panorama Size

Once the panoramas were taken the next step was to import them into Panotour. Both tours consist of over one hundred high quality panoramas. This meant that photo quality and file size needed to be optimized in order for the software to work as smoothly as possible. The team determined by testing different sized pictures that 1Mb +- 200kb was an appropriate size that would not oversaturate the software. The team was able to convert all the pictures to their target

size with the use of Photoshop so that quality of the panoramas was not compromised. This led to optimal software performance and high quality virtual tours.

4.3: Trail View Software

The trail view team used two key pieces of software for virtual tour creation: 360 Panorama to create and stitch the panorama, and Panotour to create the virtual tours. The 360 Panorama app received heavy use. This resulted in some glitches and crashes that forced the team to re-take several pictures. However these problems were sporadic and did not cause many delays overall. Considering 360 Panorama was only $0.99 the app worked well beyond our expectations.

To compile the final tours the team used Panotour. During the testing phase the program ran fantastically. Once over 200 pictures were imported into the program however, it became sluggish. When the team determined that the pictures were too large for the program to handle it was easily solved. The size of each panorama was reduced. After this step the program started working as expected and delivered high quality interactive virtual tours.



Figure 10: Screenshot of final Gorge Path virtual tour

4.4: Website Interface

The group was successful in creating an intuitive, educational, and visually appealing website design. Consulting with Acadia National Park's Webmaster, Kristi Rugg, allowed the team to develop the site just as the park wanted.

The home page lists all the trail categorized by easy, moderate, and strenuous difficulty. The drop down bar also lists all of the trails, allowing easy access to everything no matter what page the viewer is currently on.

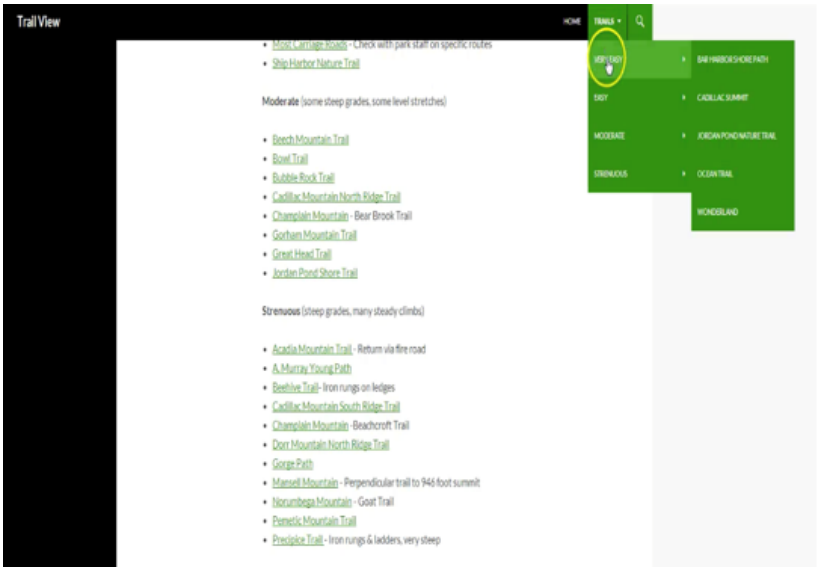


Figure 11: Website home page, displaying trail difficulties and drop down menu

Each trail links to its own personal page, where information about the trail is provided. The additional information includes: a map of the trail, virtual tour, description of the terrain, flora, fauna, observations, points of interest, history, trail audio, and statistics such as distance, elevation change, difficulty, and estimated completion time.

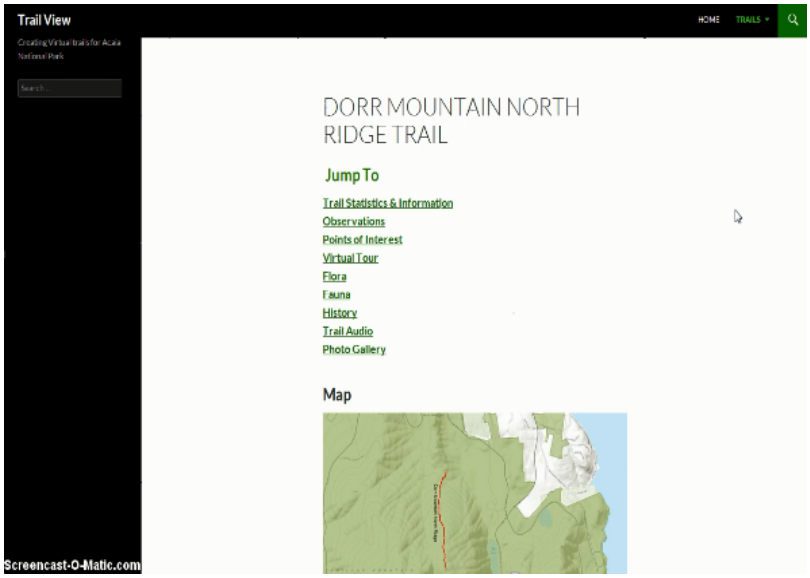


Figure 12: Screenshot of the top of the Dorr North Ridge Trail page, with jumps to other sections of the page.

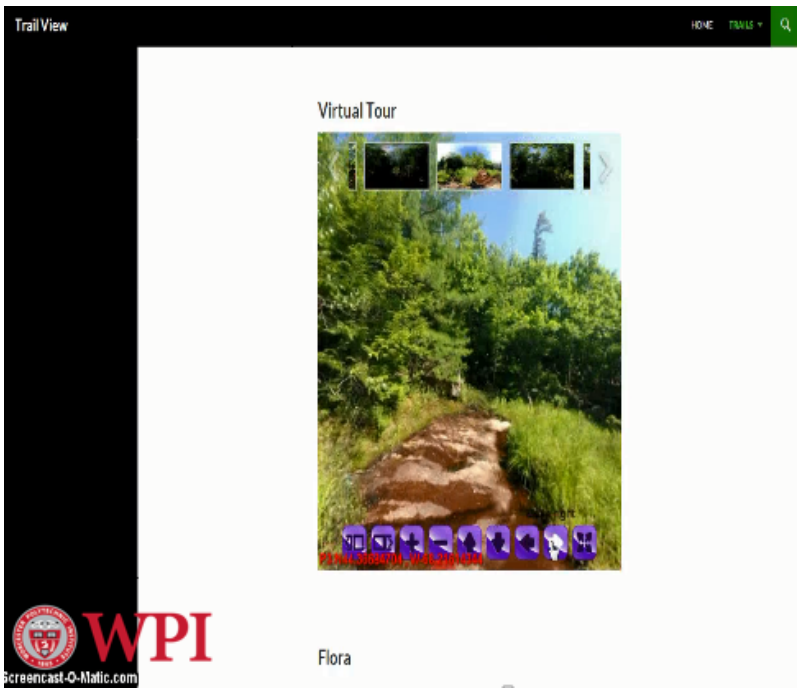


Figure 13: The virtual tour of the trail embedded further down the page

The group only filled out the pages of the trails it completed (see appendix). The site was designed with the future in mind. The other pages share the same template but need future groups to add the information as they document more trails. Sections like: observations, flora, fauna, points of interest, open up a possibility of citizen science in the future. And the site was designed as Acadia's Webmaster suggested for easier future implementation by the park.

4.5: Framework for Future Project Work

A Panotour software license was purchased for the project. This software can be passed along to future Trail View groups. In addition to the software license, information can easily be put into the website through a template the team created. With the template in place future groups will only have to add to the existing information as they document more trails. The

website is hosted locally on a single computer so all content (excluding media) and structure can be easily exported to another local server. Pictures, panoramas, and virtual tours will also be handed down to future teams.

Chapter 5: Recommendations

The Trail View team was successful in achieving its goals. Even so the team has recommendations that can help future teams enhance the quality of the project.

5.1: Camera

Using the iPod and 360 Panorama to take the panoramas was effective but it was not efficient. There are 125 miles of trails in Acadia National Park and in order to document all of them panorama taking has to be faster. In order to address this, the Trail View team recommends using a camera specifically designed for taking panoramic pictures.

The team researched these cameras thoroughly. All of them use "one shot" technology that captures a full 360 degree panorama in a single photo. With further investigation the team determined that the Ricoh Theta camera was the best option (Ricoh Theta, 2014).

The Trail View team came to this conclusion for several reasons. The Ricoh Theta camera is small and light so it wouldn't be a burden to carry on the trails. The camera automatically orients the panoramas based on the horizon and also can link each photo to a GPS location by connecting it to a smartphone. It is compatible with most operating systems; Mac, Windows, or Linux. The camera can be mounted on a tripod and can wirelessly connect to a smartphone. This allows for the camera to be controlled from a distance, eliminating the possibility of being captured in the panorama. Lastly, the Ricoh Theta is compatible with Panotour. This is convenient since WPI Trail View bought the license for Panotour.

At $399.95 The Ricoh Theta is also one of the least expensive cameras the team researched. Purchasing the Ricoh Theta would be a useful investment for WPI Trail View. It will allow for easy, high quality, and fast documentation of trails.

5.2: Citizen Science

Another suggestion the Trail View team has is for future teams to focus on the idea of incorporating "Citizen Science" into the project. Acadia National Park is not just a vacation destination. The surrounding area is full of scientific communities that consider the Park a major source of research. Finding a way to involve these driven community members with the WPI Trail View project would be beneficial. By expanding the project the trail data would be filled out more quickly and the content of the website would grow significantly.

One way to achieve this could be to create an app. A Trail View app could use the GPS feature on smartphones to track progress through trails. It could also allow for park visitors to note their observations on the website or a forum with other app users. While walking the trails people can upload their findings directly to a WPI server, which could feed the information to the Acadia one in time.

The poor wireless internet connection in the park wouldn't even be a hindrance. Past WPI IQP projects, such as Venice Noise, have utilized technology that allows app users to upload data no matter the internet connection. The information is temporarily stored in the app until there is enough of a connection to send it to the server. If this was applied to a Trail View app it would mean data from all over the park could be gathered and stored on an online server as soon as possible.

Chapter 6: Conclusions

The Trail View team has successfully used virtual tours to capture the natural essence of Acadia National Park. The team has housed these virtual tours and educational information about the trails on a working WordPress template. This project addresses points 4, 17, and 19 of the Department of the Interior's "Call to Action." These points touch on increasing park accessibility in urban areas, expanding online interactive media, increasing available educational information online, and incorporating technology into the National Park system.

Using the iPod application, 360 Panorama, proved to be effective in creating panoramas quickly. The app allowed the team to take and review panoramas while on the trail as well as complete two trails in half the time it took last year's team to complete one trail. A website skeleton was designed and serves as a template for the park and future trail view teams to fill in and expand. The team recommends future teams to use the Ricoh Theta camera to make documentation of trails even faster.

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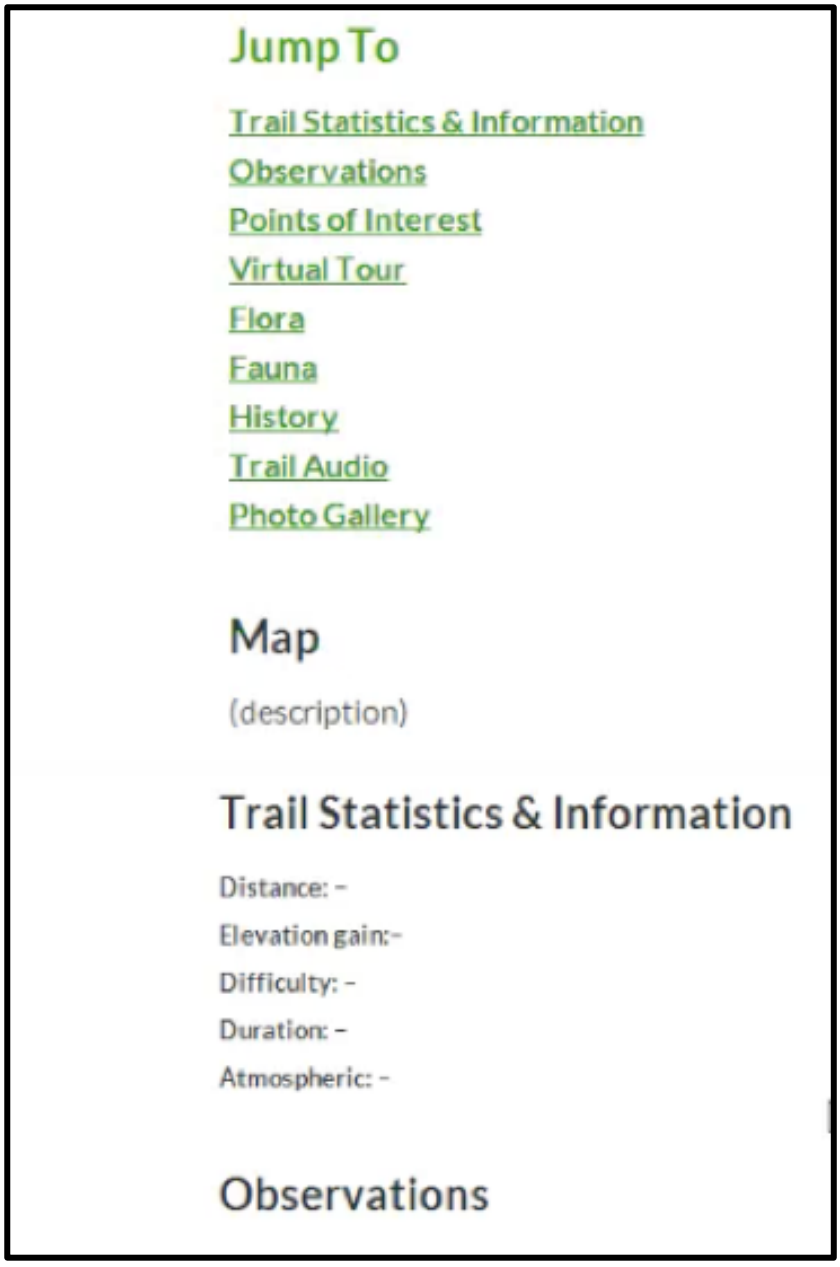
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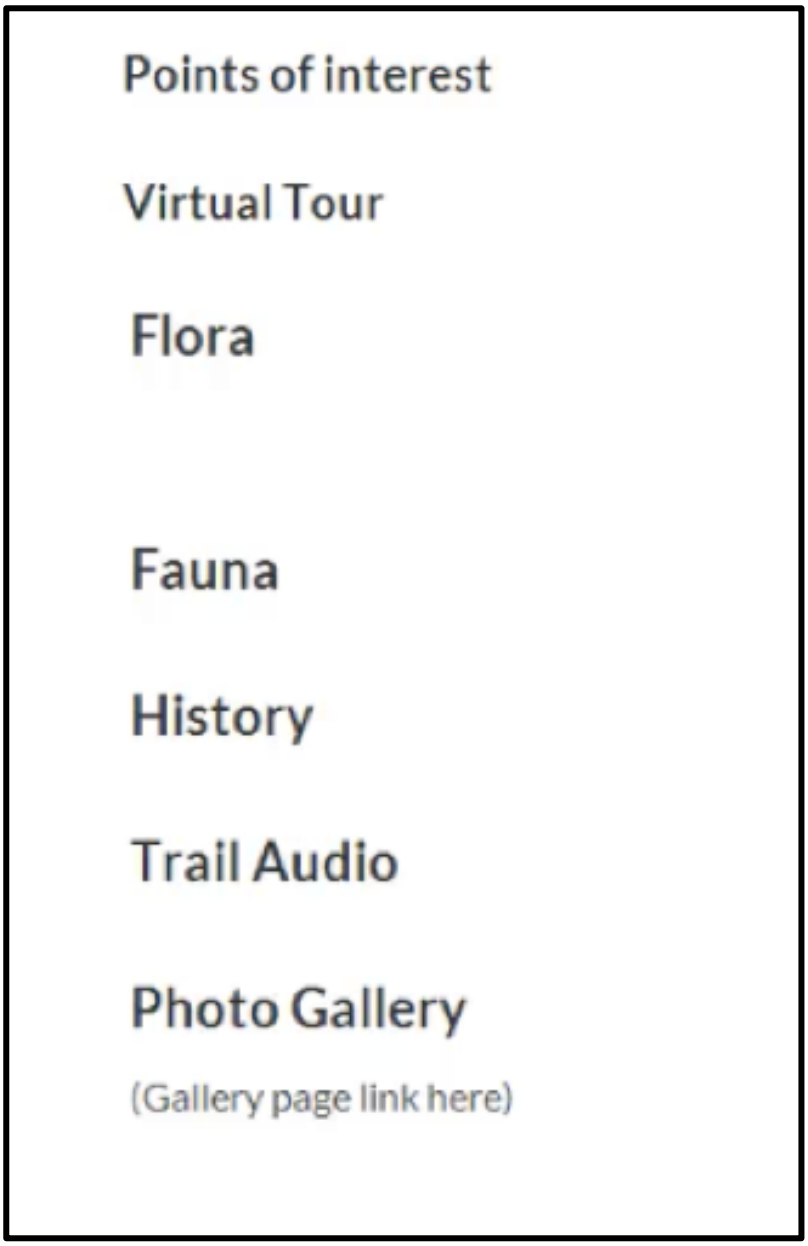
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Appendix A



Website template for trails



Continued website template for trails

Example of Filled in Trails from Website

GORGE PATH

Jump To

Trail Statistics & Information
Observations
Points of Interest
Virtual Tour
Flora
Fauna
History
Trail Audio
Photo Gallery

Map



Traveling in the wet and wooded ravine between Cadillac and Dorr mountains Gorge path leads to the spectacular views of the highest peak in Acadia. The hike highlights the steep gorge walls, a memorial plaque, a quiet stream and occasional views of the water and outer islands. Gorge Path provides the best contrast between dark forest and open summit of all the trails up Cadillac.

√ Wooded

√ Open Rock Face

√ Stone Steps

√ Creek Crossings

√ Tree Roots

- Crushed Gravel surface
- Rung Ladders
- Steep Grade
- Dog Friendly

Trail Statistics & Information

Distance: 3.6 mile round trip
Elevation gain: 1,350 ft
Difficulty: Strenuous
Duration: 3-4 hours
Atmospheric: –

Observations

Shaded and cool even on warm days. The path is along a river, and one point the path is the river. Very difficult after rain due to wet rocks and high waters along the river.

Points of Interest

About five tenths of a mile down Gorge Path there is a bronze plaque that reads, “In loving memory of Lilian Endicott Francklyn 1891-1928. This trail is endowed by her friends”



Bronze Plaque



River

The Gorge Path follows a river between Dorr Mountain and Cadillac Mountain. Many times the river becomes the trail with stepping stones at water level.

Virtual Tour
(Hold place for tour)

Flora



Common Hair Moss (Polytrichum commune)

Polytrichum commune is a medium to large moss. It is dark green in color, but becomes brownish with age. The stems can occur in either loose or quite dense tufts, often forming extensive colonies. The stems are most typically found at lengths of 5 to 10 cm, but can be as short as 2 cm or as long as 70 cm. They range in stiffness from erect to decumbent (i.e. reclining) and are usually non-branched, though in rare cases they may be forked.

Cladonia rangiferina, also known as reindeer lichen is a light-colored, brittle lichen. The color is grayish, whitish or brownish grey. *C. rangiferina* forms extensive mats up to 10 cm tall. The color is grayish, whitish or brownish grey. It forms extensive mats up to 10 cm tall. This lichen often dominates the ground in boreal pine forests and open, low-alpine sites in a wide range of habitats, from humid, open forests, rocks and heaths.



Reindeer lichen (C. rangiferina)

Fauna



Oak Apple Gall

Oak apples range in size from 2–5 cm in diameter and are caused by chemicals injected by the larva of certain kinds of gall wasp in the family Cynipidae. The adult female wasp lays single eggs in developing leaf buds. The wasp larvae feed on the gall tissue resulting from their secretions before hatching in mid-summer.

Tiger Swallowtail Butterflies (*Papilioglaucus*) are native to North America. It is one of the most familiar butterflies in the eastern United States. The *P. glaucus* has a wingspan measuring 7.9 to 14 cm (3.1 to 5.5 in). The male is yellow with four black "tiger stripes" on each forewing. Females may be either yellow or black, making them dimorphic.



Eastern tiger swallowtail (Papilio glaucus)

History

Trail Audio

Photo Gallery

(Gallery page link here)

DORR MOUNTAIN NORTH RIDGE TRAIL

Jump To

Trail Statistics & Information
Observations
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Virtual Tour
Flora
Fauna
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Photo Gallery

Map



The hike on Gorge path and Hemlock trail to the trailhead of Dorr North Ridge provides a gentle walk through the forest. Dorr North Ridge's steep rocky trail turns from forest to open rock face. The open rock sheets have few trees, but allows for spectacular views of the Bar Harbor area.

√ Wooded

√ Open Rock Face

- Stone Steps

- Creek Crossings

- Tree Roots

- Crushed Gravel surface

- Rung Ladders

√ Steep Grade

- Dog Friendly

Trail Statistics & Information

Distance: 4.0 miles round trip
Elevation gain: 1170 ft
Difficulty: Strenuous
Duration: 3 hours

Observations

Can access via Gorge Path and Hemlock, Emory trail, or Kebo Mountain. Very rocky and steep, changes elevation quickly.

Points of interest



Dorr Mountain Summit

The summit of Dorr Mountain, although not as traveled as its larger brother, Cadillac, still offers great 360 degree views. To the east lies Bar Harbor and to the west rises the summit of Cadillac.

Virtual Tour

(Hold place for tour)

Flora



Blueberries

The heights of blueberry bushes vary depending on the variety. Standard blueberry bushes grow between 6 and 10 feet tall, while the dwarf cultivars just grow between 1 and 2 feet. At the base, blueberry shrubs have multiple canes growing directly out of the soil in clumps. They also have glossy leaves that are either green or bluish green from spring through summer. In the fall the leaves take on a reddish tint, and they also shed their leaves in the late fall, early winter.



Immature Lodge-pole Pine Cone

The lodge-pole pine cone's name comes from its long slender trunk which Native Americans used to make teepees. Its needles come in bunches of two. Seed cones vary in shape from short and cylindrical to egg-shaped, 2 to 4 centimeters long without stalks. The seed scales have sharp prickles at their tips.



Cluster of Lodge-pole Pine Cone

Fauna



Gypsy Moth Caterpillar

The Gypsy Math Caterpillar is very harmful to oak trees, stripping them down to the stick. In some cases, entire forests are stripped of their leaves. Attempts to save the forests have been made by spraying a kind of bacteria that kills the caterpillars and although it works, it also kills many other species of caterpillars in addition to the gypsy moth.

History

Dorr Mountain is named after the "Father of Acadia", George Dorr (1855–1944). As a young man George Dorr loved nature. In 1868 Dorr visited Mount Desert Island on a family vacation. He decided to make MDI his primary home. Never marrying, George Dorr focused his time, energy, and intellect on preserving the natural beauty of what will later become Acadia National Park.

Trail Audio

Photo Gallery

(Gallery page link here)