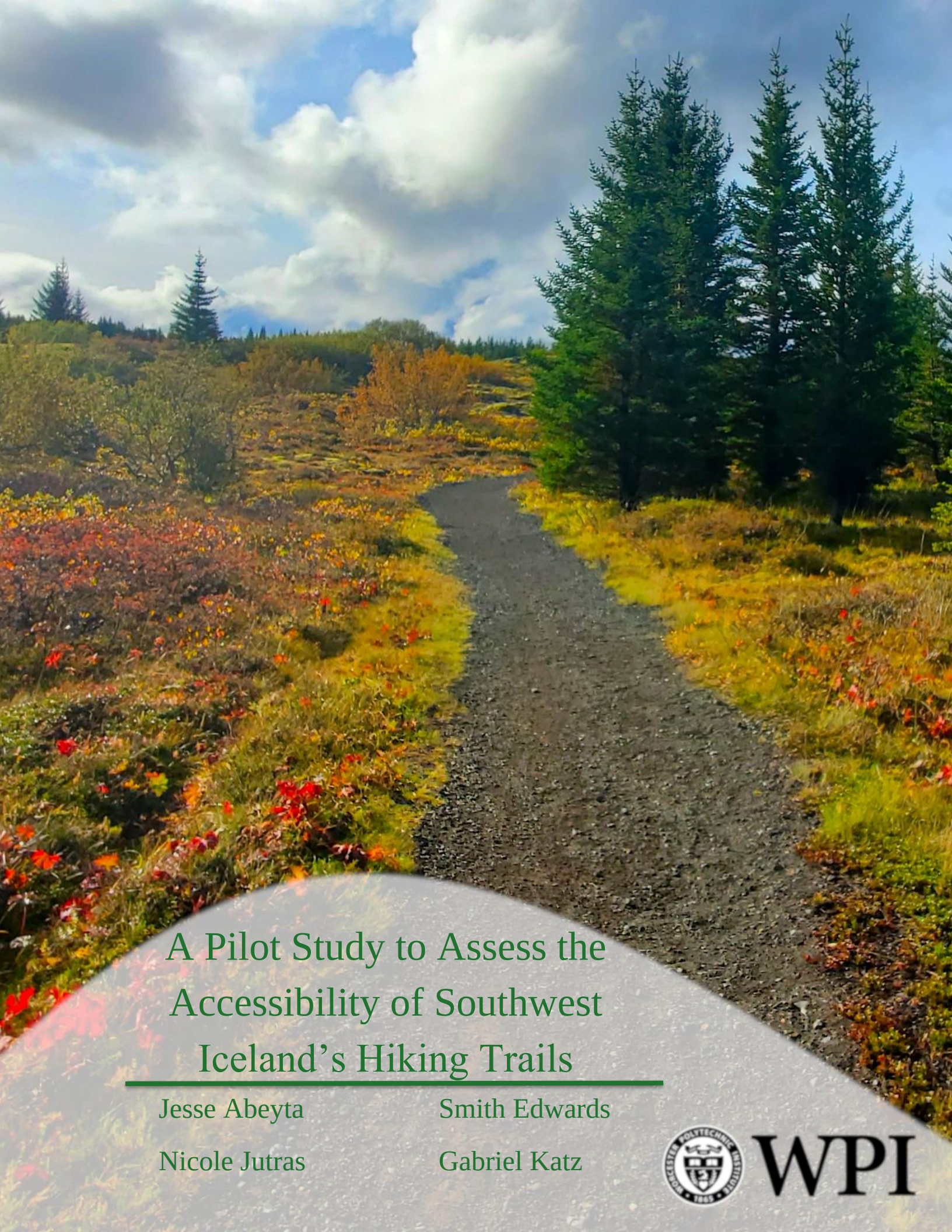

A Pilot Study to Assess the Accessibility of Southwest Iceland's Hiking Trails

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WPI

A Pilot Study to Assess the Accessibility of Southwest Iceland's Hiking Trails

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Submitted to the Faculty of
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Abstract

International tourists come to Iceland to enjoy outdoor activities like hiking, however it is not known if trail markings and signage are created for ease of accessibility. We assessed trails around Reykjavík to learn if they were accessible to international visitors. We documented the state of the trails and contacted hikers and stewards to hear opinions on trail accessibility. We determined the strengths and weaknesses of the trails. Our recommendations include adopting a standard for trail markings, for sign production, and for how trails are maintained in order to accommodate a variety of visitors. We also recommend that a project be implemented to analyze the adoption of these standards and for the creation of a conference where Iceland's hiking organizations can address these issues.

Executive Summary

Introduction and Literature Review

International visitors rely on clear markings and signage to navigate Iceland's trails and avoid hazards. For this guidance to be helpful, the trails and maps must feature symbols or words that any hiker can understand. Because visitors to Reykjavík speak a variety of languages, signs and markers that are useful to one international hiker might be of less value to another. Although proper signage and trail markings are an important part of the hiking experience, developing signs and markings that are informative and accessible to international tourists is not easy. The authors of this report experienced issues firsthand while hiking Mt. Esja, one of the more popular recreational mountain hikes in Iceland. A sign at the starting point of the trail had a map and detailed the routes up the mountain in English and Icelandic, but signs further along the trail were only posted in Icelandic and in some locations, lacked adequate and informative trail maps.

Figure A. *A well-marked trail.*

Methodology

The goal of this project was to evaluate hiking trail markings and signage in the greater Reykjavík area to determine trail accessibility to international tourists. To accomplish our goal, we developed the following objectives and methodologies for data collection:

1: Gather information on the current accessibility of the hiking trails near Reykjavík
We hiked trails at five different locations and recorded observations on the trail accessibility. The factors we documented included sign quality, frequency, and language, as well as destination accessibility for tourists.

2: Understand current practices for creation and maintenance of trails
We interviewed a representative from the Environment Agency of Iceland (UST). They were able to share information about the standards currently in place when constructing new trails in a national park or reserve. We also researched trail standards used in Iceland and other countries.

3: Evaluate international hikers' perceptions of the trail markings and signage
We interviewed international hikers we encountered along the trails. This allowed us to better understand what the tourists enjoyed and were challenged by on the trails, particularly regarding the trail markings and signs.

4: Identify the strengths and weaknesses of each trail
We produced a rubric to grade trails on marking, signage, destination accessibility, and several other factors. Each criterion in the rubric was developed based on our background research and our experiences of the trails.

Results and Discussion

Trail Accessibility

After hiking a sample of trails, we realized that there were major inconsistencies in the quality of trail markings. On several trails, there were both high quality, informative markings along with markings and signs that were missing, hard to find, and difficult to interpret. There were no clear standards for markings or signs across all of the hikes we evaluated. There were also significant inconsistencies regarding the language of the signs. Some signs were in both English and Icelandic, while many others were only in Icelandic. Finally, we found that a majority of the trails in the Reykjavík area were difficult to reach without a car. Most advertised trails were not directly accessible by public transportation and require up to several hours of walking to reach the trailhead.

Trail Stewardship

We met a director at the Environment Agency of Iceland's (UST), and learned that the UST constructs and maintains all trails in Iceland's national parks and reserves. Hiking trails outside these locations are maintained by a variety of private hiking clubs. The UST uses standards for trail construction from a Scottish handbook titled Upland Pathwork: Construction Standards for Scotland. The handbook prioritizes the continuous upkeep that needs to take place in order to combat damage done to signs and trail markings by the weather.

International Hikers' Perceptions

We interviewed thirteen hikers and one restaurant worker to gain the perspective of other hikers. Six hikers we consulted on Mt. Esja encountered difficulty navigating the trail at some point due to insufficient trail markers. Furthermore, half of the participants mentioned that the signs were only written in Icelandic, which was a problem as most of the hikers encountered to did not understand this language. On Viðey Island, the majority of hikers we interviewed considered the hiking trails to be in poor repair, citing trail markers that were difficult to see, signs that were damaged, and trails that were flooded.

Strengths and Weaknesses Analysis

Below is a table summarizing the strengths and weaknesses with a number of categories ranked from 1 (poor, weak, nonexistent) through 5 (well done, excellent) for each hike. For individual explanations of the criteria, see Section 4.4 of the main report.

	Esja	Hveragerði	Heiðmörk	Viðey	Elliðaárdalur	Öskjuhlíð
Website Info	4	**5**	3	**5**	2	2
Destination Accessibility	4	2	4	4	**5**	**5**
Trail Condition	4	N/A	**5**	4	4	**5**
Trail Difficulty	4	N/A	2	**1**	**1**	**1**
Trail Markings	2	N/A	**5**	2	**1**	**1**
Signage	2	N/A	**5**	2	**1**	2
Services	**5**	4	2	**5**	3	3
Monetary Cost	$$	$$$	$$	$$$$	$$	$$
Required Hiking Gear	Moderate	N/A	Minimal	Minimal	Minimal	Minimal

Table A. *Scores earned by each hike*

As can be seen in this table, there was significant variance in the overall accessibility of each trail. It is clear there is no standard for some of these aspects, in particular trail conditions, trail markings, and signs, given the differences in each score for every hike.

Recommendations

Adopt a standard that is universally accepted and understandable for hikers of different nationalities for all trail markers and signs.

One universal standard would promote consistent accessibility of hiking trails for tourists. We recommend all hiking clubs and organizations use the standards found in the Upland Pathwork: Construction Standards for Scotland handbook that are currently used by the UST. With consistent use of these standards, hiking trails would be improved across Iceland.

Use both English and Icelandic for all trail maps and signs

Signs should be posted in two languages: English and Icelandic. However, signs were frequently written in only Icelandic. We recommend signs be posted in English as well as Icelandic in order to reach the approximately 45% of visitors in Iceland who come from native English-speaking countries (Icelandic Tourist Board, 2018). In addition, it is likely that many more visitors read English at some level of understanding.

Use color codes for all trail markers

We strongly encourage obvious and bright trail markings at every junction on a trail, indicating which path is primary. We recommend that colors follow a standard, and that all trail markings are consistently in that color. For this method to be effective, the trail markers need to be placed within sight on the trail.

Develop signs and markers that have long term resilience

We encountered many signs and trail markers in poor condition. The signs and markers have to be able to endure the heavy precipitation that is typical of Iceland. We recommend that trail signs be evaluated on a yearly basis to see if they are still intact and legible.

Complete a hiking trails project in the 2020 academic year that organizes a conference of hiking stewards across Iceland to discuss standards of trail maintenance

We recommend that the creation of a hiking stewards conference be taken on as a project next year (2020) as a part of the WPI Reykjavík Project Center. The project could focus on organizing a conference and identifying key attendees, as well as a thoughtful agenda, where all aspects of trail development, marking, advertising, and maintenance could be discussed on a yearly basis.

Identify a sponsor for continued research and implementation

Identifying a local sponsor is critical to the success of this future project. Many hiking clubs and organizations exist that could benefit from the continuation of this research project. We identified three organizations that would be suitable sponsors: Ferðafélag Íslands, the Environment Agency of Iceland, and the Icelandic Search and Rescue.

Summary

Because 12% of Iceland's GDP comes from the tourism industry, it is vital to prioritize planning how Iceland's natural environments are made accessible to international visitors (Arion Research, 2018). Iceland's trails are managed by a variety of private clubs and governmental organizations, with each following their own standards. The differences in trail standards and management are reflected in the quality of maintenance, style of signage, and overall accessibility of the trails. While the differences in the geography of each trail must be taken into account, hiking in the Reykjavík area can be made significantly more accessible by the adoption of universal standards.

Acknowledgements

We would like to thank the following individuals for their assistance and guidance throughout our project to ensure it was a success.

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- The representative from the **Environment Agency of Iceland** who provided insight to Iceland's hiking trails for his time
- **Worcester Polytechnic Institute**, for the opportunity to complete this research project at the Reykjavík Project Center

Authorship

All team members contributed to the writing and editing of this proposal. Extensive editing was done by all team members on each section. The primary author or authors of each section are listed below. We would also like to give credit to Smith Edwards for creating the maps found in Appendices D, E, F, G, and H. All pictures or tables that are not credited were taken or created by a member of the team.

Section	Contributors
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Abstract	Nicole Jutras
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Acknowledgements	Gabriel Katz
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1.0 Introduction

"*Of all the paths you take in life, make sure a few of them are dirt"*
-John Muir, prominent American environmentalist

Iceland's vast tracts of unspoiled lands and unique geography have proven highly attractive to international tourists. When asked about why they came to Iceland, more than 90% of international visitors in one survey said the country's nature was a contributing factor, and over 70% said nature-related recreation was a contributing factor (Icelandic Tourist Board 2018, p. 14). In data collected about paid activities, visitors indicated that they went on more guided hiking tours than museum visits or trips to thermal pools (Icelandic Tourist Board, 2016, p. 13).

International visitors participating in guided, and in particular un-guided hikes, rely on markings and signs to navigate Iceland's trails and avoid hazards. For this guidance to be helpful to an international hiker, trail signage and maps must feature universal symbols that any hiker can understand. Because visitors to Reykjavík speak a variety of languages, come from diverse backgrounds, and have unique experiences, signs and markers that are useful to one international hiker might be of less value to another.

Although proper signage and trail markings are an important part of the hiking experience, developing ones that are informative and accessible to international tourists is not easy. The authors of this report experienced issues firsthand while hiking Mt. Esja, one of the more popular recreational mountain hikes in Iceland. A sign at the starting point of the trail had a map and detailed the routes up the mountain in English and Icelandic. However, signs further along the trail were only posted in Icelandic and, in some locations, lacked adequate and informative trail maps. Unfortunately, the confusion with signage and trail marking on Mt. Esja made the trail less accessible and enjoyable to us, and likely has made it less accessible to other international tourists as well.

The goal of this project was to evaluate hiking trail markings and signage in the Reykjavík area to determine trail accessibility to international tourists. To accomplish our goal, we first gathered information on the current accessibility of the hiking trails near Reykjavík. Then we sought to understand the current practices for creation and maintenance of trails. Next, we evaluated international hikers' perceptions of the trail markings and signage. Finally, we identified the strengths and weaknesses of the trail markings and signs. This report presents relevant background material, describes the methodological strategies used to address our project goal, and shares our results and recommendations.

2.0 Literature Review

In this section, we identify who maintains the hiking trails in Iceland, and describe the profile of the kinds of tourists who hike on trails in the greater Reykjavík area. To better understand what is meant by trail accessibility we also discuss best practices and standards for hiking trails.

2.1 Stewardship of Icelandic Trails

In 2003, the Environment Agency of Iceland established the Iceland Conservation Volunteers (ICV), a group of international volunteers that maintain hiking trails in Iceland (Gunnarsdóttir, 2012). The ICV's mission states their overall goal:

> Our work in the country's wilderness areas is steadily growing and includes trail marking with sticks, GPS mapping, trail maintenance, sign construction and the removal of invasive plant species … from protected wilderness areas (EAI, 2011, p. 1).

To accomplish this mission, every summer approximately 200 volunteers travel around the country to inspect trails and perform maintenance. This work is primarily done in national parks, protected areas, and nature reserves (Gunnarsdóttir, 2012). **Figure 1**, below, displays the current ICV volunteer sites across Iceland, several of which are located in the Reykjavík area.

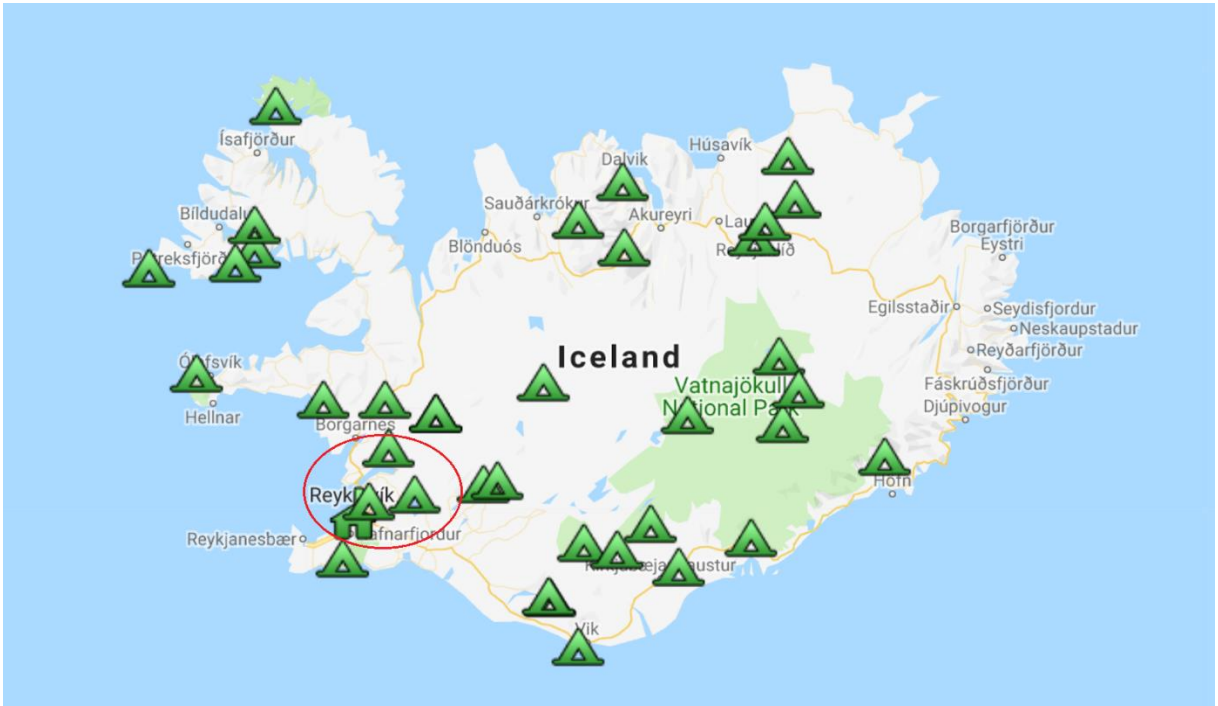

Figure 1. *ICV volunteer sites across Iceland, where the red circle indicates the approximate area of hiking trails covered by this report (Environment Agency of Iceland. (n.d.)).*

A study of the ICV volunteer efforts found that "clearly marked trails, barriers and signs help keep visitors on trails and minimize negative impacts of trampling on the surrounding environment" (Tverijonaite, Ólafsdóttir, & Thorsteinsson, 2018, p. 2). However, despite the ICV's upkeep of Iceland's national parks and reserves, there have still been complaints about poor signage and trail markings (Huber, 2014). In a journal titled *Visitors' Satisfaction of Recreational Trail Conditions in Thingvellir National Park, Iceland*, Huber expressed that "a main dissatisfaction the visitors' survey identifies [is] insufficient labeling and signposting along the trails" (2014, p. iii). Not only have signage and inadequate trail markings been identified as an issue in the past, maps of hiking areas have also been criticized. When tourists were asked about the Laugavegur hiking trail, they emphasized how ill-equipped they felt they would be in the case of an emergency on the trail (Bird, Gísladóttir, & Dominey-Howes, 2010). As one report noted:

> One critical point raised by many participants was the inadequacy of the hazard map. The map failed to 'communicate to them' the location of the hazard zone and evacuation routes (Bird, Gísladóttir, & Dominey-Howes, 2010, p. 2).

Based on the survey results, the visitors' confusion is attributed to the poorly labeled and documented maps of the area. Further questions revealed that "tourists found the map confusing and inappropriately scaled for the region" (Bird, Gísladóttir, & Dominey-Howes, 2010, p. 2). These dissatisfactions with Iceland's trails could worsen many visitors' hiking experiences. Indeed, of Iceland's annual 2.2 million visitors, over 21% visited Þingvellir National Park (Icelandic Tourist Board, 2018, p. 24), which is maintained by the UST. These concerns would then seem to imply that over 450,000 visitors were potentially affected by shortcomings in trail stewardship in the Þingvellir National Park alone.

2.2 The Profile of Tourists in Iceland

Tourism is only relatively recently a major component of the Icelandic economy, being responsible for 12% of Iceland's GDP in 2017 (Arion Research, 2018). Similarly, approximately 12% of jobs in the Icelandic economy relate to tourism (Brynjolfsson et al., 2018). Since the year 2000, there have been more international visitors to Iceland every year than native Icelanders. While the Icelandic population has been increasing at a rate of ~1.4% (Statistics Iceland, n.d.) per year since 2010, the number of yearly visitors has grown at an average annual rate of 24.3%

(Icelandic Tourist Board, 2018, p. 6). To put this into context, as of 2017, there were 3.1 foreign visitors for every Icelandic resident (Icelandic Tourist Board, 2018, p. 6).

The Icelandic Tourist Board groups visitors from countries into five main "market areas": North America, UK, Central and Southern Europe, Nordic Countries, and Other. Tourists from the UK and North America market region represent 45.6% of visitors to Iceland (Icelandic Tourist Board, 2018). English is the most common language in these regions, implying that about half of tourists to Iceland are native English speakers.

Figure 2. *Tourists viewing Gullfoss.*

The Central and Southern Europe market region makes up 19.7% of tourists, while tourists from the Nordic Country region represent 8.3% of visitors (ibid). Taken together, about 28% of visitors to Iceland can be assumed to be Europeans from a country that does not primarily use English. However, the majority of countries in Europe have been rated as having populations with an average English Proficiency of "moderate" or better (Education First, 2018). Taken together, this suggests that most visitors to Iceland can understand English and would benefit from English signage on hiking trails.

2.3 Expectations and the Experience of Hiking

Hiking is a facet of nature-based tourism that draws people from around the world. It is regarded as one of the most environmentally friendly economic uses of natural resources (Li, 2005). Countries like Portugal and Greece even attract international tourists specifically to enjoy their hiking trails and landscapes (Kastenholz, 2007; Tzavella, 2017).

According to the U.S. National Parks Service, access to these natural areas can vary while still being referred to as "hiking." They note, "some foot trails are rugged dirt paths that lead you up

mountain tops, some foot trails are flat, paved sidewalks that meander through cities and urban areas" (2019, p. 1). There are biking paths and wheelchair accessible boardwalks as well (National Parks Service, 2019). For the scope of this project, we will restrict the definition of a trail to be a path through primarily undeveloped and natural land. Trails are typically marked in a recognizable fashion to help hikers stay on the path. **Figure 3** shows a commonly used white "blaze" that marks a hiking trail. Other kinds of trail markers include signposts and cairns (Hodgkins, 2019). While trail markings can be visually disruptive to the hiker's experience of the natural environment, they must also be durable and placed often enough to remain useful to a hiker. **Figure 4** shows a snapshot of Mt. Esja, where the environment is not visibly altered.

Figure 3. *A white trail marker is clearly visible. (NPS. (2016)).*

Figure 4. *Mt. Esja's peak.*

Trail markers are naturally disturbed over time, necessitating trail maintenance and stewardship. Weather, natural growth, and foot traffic are the biggest causes of trail degradation. Every year it is estimated that about 4,200 people volunteer 182,000 hours to maintain the Appalachian Trail (Mauldin, n.d.). For every volunteer who helps maintain the trail, it is estimated that over 800 people will use the trail (Goldenberg, 2008; Mauldin, n.d.).

2.3.1 Trail Maintenance, Measures, and Standards

While regular maintenance improves the visibility of markers and trail surface quality in general, there is more to consider in terms of accessibility. To assess the accessibility of a trail, measurements that have been used in past studies can be utilized to inform methodology design. Accessibility in terms of hiking primarily pertains to two factors (Apollo, 2017). One study defines the two aspects as:

> (1) *destination accessibility* (the transport system and on-site services) and
> (2) *real access*, which includes such factors as social, economic, weather and psychophysical environments, as well as the presence of mountaineering

> activities, all of which can have a positive or negative influence on the opportunity to engage in a given pursuit (Apollo, 2017, p. 29).

Destination accessibility is the first component in order to achieve a fully accessible hiking trail. It encompasses three different components: infrastructure, equipment, and operational factors. Infrastructure pertains to the roads, airways, or railways that connect a hiker to a path. Equipment represents the vehicle a hiker would travel in on a particular infrastructure. Operational factors include when a particular vehicle operates and where it goes to. For example, a bus route as well as its timetable would be operational factors to whether or not a hiker can reach their destination (Apollo, 2017). Other means of transportation such as walking or biking would also fall under destination accessibility.

Real accessibility is primarily focused on the actual trail accessibility once the hiker has reached their destination. In reference to the hike itself, "*real accessibility* has five main facets: social, economic, weather, psychophysical accessibility and accessibility regarding mountaineering carrying capacity" (Apollo, 2017, p. 32). The contrast between real accessibility and destination accessibility are shown in **Figure 5**.

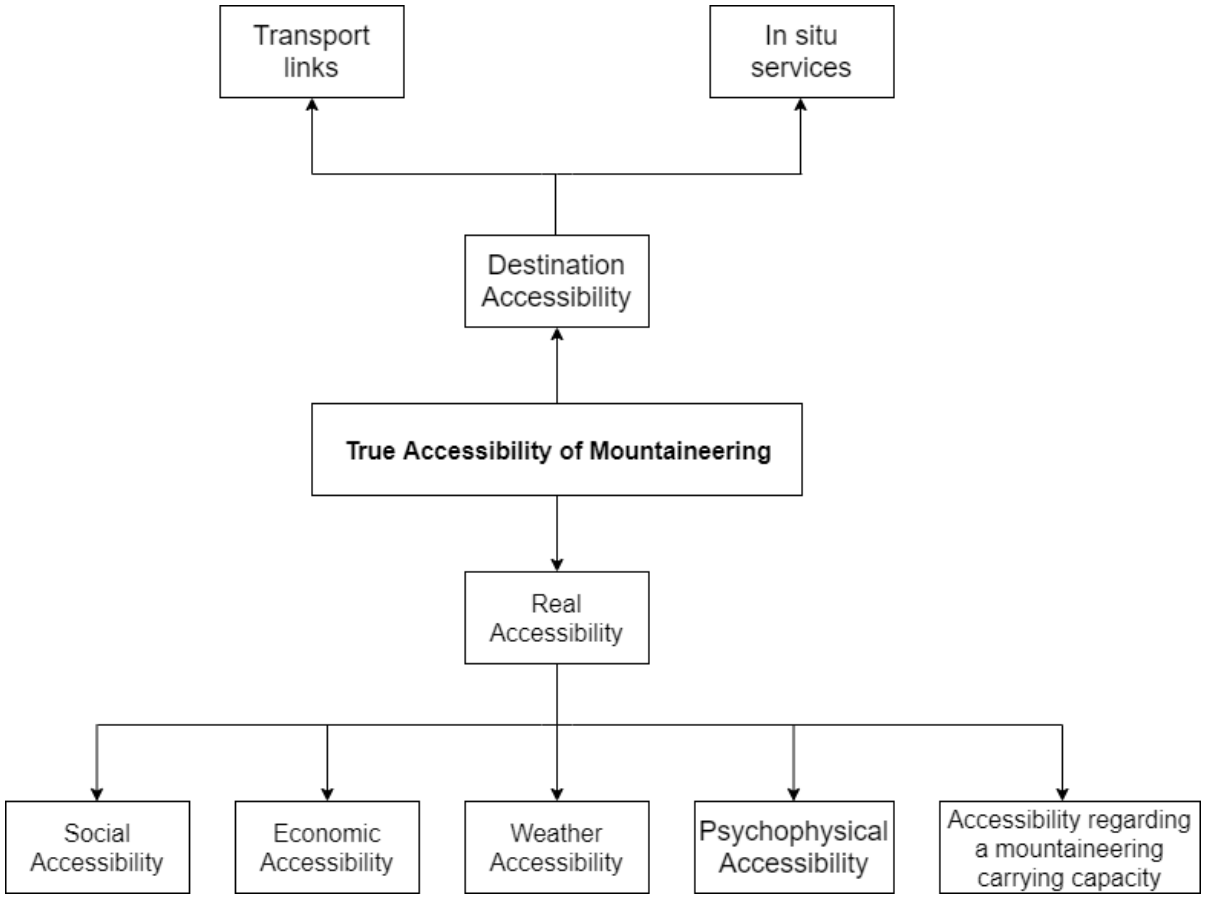

Figure 5. *Accessibility of mountaineering (Apollo, 2017).*

Real accessibility can impact who can actually use a trail. In the figure above, the social component revolves around where the trail is located and cultural rules a site has. For example, there may be gender restrictions based on cultural norms, or a political ban on different trails if they are in an area of conflict. Economic accessibility relates to the fact that many challenging hikes may require different types of hiking gear, and the cost falls on the hiker. As a result, certain trails may not be accessible to those who cannot afford the fees required to hike a specific trail or procure the required hiking equipment. For example, some trails would be difficult to traverse without crampons, ice picks, quality hiking boots, or hiking poles. Seasonal gear is also necessary, especially when hiking in colder terrains. Weather conditions can make certain trails more or less accessible to hikers in terms of difficulty and accessibility. A hike on a steep mountain trail would be far more dangerous if the slope was slick with rain or snow. Psychophysical accessibility pertains to the state of the hiker's mind and body. For example, hikers with mobility restrictions may find certain trails less accessible or even completely inaccessible to them. Similarly, hikers prone to anxiety or altitude sickness will also encounter unique challenges the higher they climb (Apollo, 2017).

2.3.2 Models of Accessible Trails

Many nations have standards to meet in order to ensure that a trail is accessible and that the directions and signage are easy to follow. These standards typically instruct how and where trail markings should be placed. Additional standards include rules on how to make a sign easily understandable to as many hikers as possible. This section will discuss two effective models that are currently being used in Switzerland and the United States.

Example 1: The Swiss Wanderwege

Since 1934, the Swiss Hiking Association has created and maintained a highly standardized method of marking trails along the Swiss Wanderwege (Trail Signs in the Swiss Alps, n.d.). The ease of understanding these signs and trail markers stems from their simplicity. Swiss trails are clearly marked:

> Yellow signs, often in the shape of a diamond, indicate a pedestrian or walking trail, red and white signs or paint marks on trees and rocks tell you that you are on a hiking or mountain trail with more significant elevation gains and losses than a pedestrian trail, and blue signs indicate technical alpine routes and require additional safety equipment (ibid).

As **Figure 6** shows, standardized markings and signage makes it easy for both Swiss and international visitors to understand trail markings and signage. The Swiss trail marking method is successful because there is constant upkeep of the signs. In Switzerland, "each sign and hiking trail is inspected in detail each year" (ibid).

Figure 6. *Trail markers on the Swiss Wanderweg (Trail Signs in the Swiss Alps, n.d.).*

Furthermore, the signs list distance in kilometers as well as hours at an average walking pace, as seen below in **Figure 7**. The inclusion of distance in terms of time makes the trail more accessible to any hiker. These signs are also color coded by difficulty. The colors on the signs correspond to the colors of the markings on the trail they point to.

Figure 7. *Swiss Wanderwege signpost (Einsiedeln-Ybrig-Zürichsee. (n.d.)).*

There is also a website with extensive details of every known hike in Switzerland called SwitzerlandMobility. This website provides elevation details, estimated time of the hike, the distance of the hike, if there are multiple stages in the hike, largest ascents and descents, difficulty rating, fitness level recommendation, and best time of year to hike the trail. Much of this information is not only listed, but is also shown in picture form.

The clarity and abundance of hiking and trail information is simple to understand and access from this website, as well as the free mobile app. Both the website and the app also provide

several language options: English, German, French, and Italian. The detail of the information available, along with the customizable options on the website and app, allows for a wider range of people to access it.

Example 2: The U.S. Forest Service Trail Guidelines

The United States Department of Agriculture (USDA) uses a standard known as Forest Service Trail Accessibility Guidelines (FSTAG) that all trails within the National Forest System are legally required to follow (USDA, 2015). These standards specify trail design standards, a designated number of rest-stops according to the difficulty of the hike, and proper signage including information about the trail ahead. This information includes the length of the trail, what type of surface the trail consists of, and the most recent assessed condition of the trail (USDA, 2015). The FSTAG also has rules and restrictions that protect the natural wildlife and the surrounding environment (USDA, 2015). These standards provide resources that make hiking in the National Forest System more accessible to both tourists and natives.

2.4 Summary

Tourists in Iceland want to hike, but there is evidence of chronic dissatisfaction with the current state of trail markings and maps. We learned that standards exist as models that could inform proposals to upgrade Icelandic trails. The literature on hiking accessibility has shown the importance of frequent and standardized trail markings and signs. We also learned that both destination and real accessibility factors must be taken into account when developing a trail. These key ideas need to be considered when evaluating trail markings and signs designed to make trails accessible to a wide range of hikers.

3.0 Methodology

The goal of this project was to evaluate hiking trail markings and signage in the Reykjavík area to determine trail accessibility to international tourists. To accomplish our goal, we developed the following objectives:

1. Gather information on the current accessibility of the hiking trails near Reykjavík.
2. Understand current practices for creation and maintenance of trails.
3. Evaluate international hikers' perceptions of the trail markings and signage.
4. Identify the strengths and weaknesses of the trail markings and signs.

These objectives and their associated data collection strategies are described in detail below.

3.1 Gather information on the current accessibility of the hiking trails near Reykjavík

In order to understand the current state of the accessibility of hiking trails, we identified and hiked a sample of nearby trails. We conducted site assessments of each trail, noting information about the trails that informed our choice of interview questions and provided a grounding perspective for evaluation.

In the process of selecting hikes, we focused on popular trails in greater Reykjavík. The Nordic Association of Travel identified several popular trails in this area. We used the website of Strætó, the local bus company, to determine how accessible each trail was by public transportation. Our analysis took into account travel time by bus, walking distance, and ticket expense. After considering these factors, we decided to hike Mt. Esja, Hveragerði, Heiðmörk, Viðey, Elliðaárdalur, and Öskjuhlíð. We chose these hikes because the destination accessibility of each of them was better than the alternatives.

While on the trail, we paid special attention to trail signs and markings as we found them. To record the condition of trails and signs, we photographed each one we encountered and noted where the trails were poorly marked. In addition, we recorded our routes using GPS software to note locations where we lost the trail.

To calibrate trail accessibility levels, we recorded subjective ratings on the unique features of every trail. These data were stored in a basic checklist which we used to evaluate every hike we embarked on. The checklist is elaborated upon further in Section 3.4, where we discuss the strengths and weaknesses of each trail.

3.2 Understand current practices for creation and maintenance of trails.

To address this objective, we interviewed an expert from the Environment Agency of Iceland (UST). This organization plays a role in the creation and maintenance of hiking trails in the

Reykjavík area. The expert we interviewed at the UST provided us insight on the existing processes by which signs and trails are created. Interviews asked about standards to increase hiking accessibility while still minimizing the impact on the natural experience. For interview topics and the informed consent paragraph, see Appendix A.

We decided to conduct open-ended interviews to allow the representatives to guide the conversation. Open-ended interviews allow for the subject to give a more thorough explanation than a semi-structured or structured interview. Our interview strategies included two researchers: one to conduct the interview, and one to take notes.

We also conducted research on current and best practices for trail maintenance, using the websites of significant hiking organizations and documents referred to us by our interviewees. In particular, our group researched the trail standards noted in this Scottish manual. Prior to the interview, we read about the trail guidelines established by the Swiss Wanderwege and the U.S. Forest Service. Knowledge of trail standards gave us a framework to judge Icelandic trails.

3.3 Evaluate international hikers' perceptions of the trail markings and signage

We accomplished this objective by conducting semi-structured interviews with hiking tourists. We chose to interview tourists on hiking trails close to Reykjavík because this allowed us to gather data that encompassed a variety of perspectives from international visitors.

We used semi-structured interviews to identify how international hikers view the quality and accessibility of the trails near Reykjavík. We found participants on trails and interacted with hikers we encountered. These participants were actively using the trail and had recent experiences on the accessibility of the trails. Some subjects were interviewed after their hike for convenience. For the interview questions and the informed consent paragraph, see Appendix B.

3.4 Identify the strengths and weaknesses of each trail

To identify strengths and weaknesses, we categorized our findings from objectives one and two according to informative and multilingual signage, plentiful and visible trail markings, and quality trail maps. We generated a checklist of unique trail features in this document and recorded outlying features that were not commonly seen. Checklist points included: if the trail was mostly paved, if it possessed multilingual signs, if the signs on the trails have maps, if there are markings on the trail, if the trail is accessible through public transportation, if the trail is less than an hour walk after using transportation, if extra expenses are required other than a city bus pass, and if the trail is mostly flat. The completed checklist can be found in Appendix C. We also created a rubric to evaluate some of these criteria in more depth. These criteria included website info, destination accessibility, trail condition, trail difficulty, trail markings, signage, services, monetary cost, and required hiking gear.

3.5 Data Management

We coded observations and interview transcripts into categories and subcategories based on common themes and sentiments. After the coding process, we examined trends and interesting findings. Any GPS data we recorded was converted into a digital file. Using a combination of the GPS coordinates we found and recorded, we visualized maps of the trails using GPXSee. This software displays GPS routes together in a map. Using this software and our GPS data, we produced maps of the trails we hiked.

4.0 Results and Discussion

We discuss our results and findings of our investigation below, organized by objective.

4.1 Gather information on the current accessibility of the hiking trails near Reykjavík

As a team we identified eight hikes, attempted six, and successfully completed five: Mt. Esja, Heiðmörk Nature Reserve, Viðey Island, Elliðaárdalur, and Öskjuhlíð. Our hike at Hveragerði was not completed but is discussed below. For each trail, we collected information on the state of the paths, markers, and signage as well as how difficult it was to access via public transport. To see a complete map of where these hikes are located, see Appendix D. We also found or recorded GPS data for each of our hikes. The maps of each of our completed hikes are located in Appendices E, F, G, and H. Unfortunately, we were unable to collect data on our hike to Viðey Island. The trails we hiked were chosen based on their potential destination accessibility, which we first analyzed in the table below. The table is coded so that green indicates hikes the team completed, yellow are hikes the team attempted, and red are hikes the team did not attempt.

	Bus Travel Time	Walking Distance From Hallgrímskirkja	Additional Travel Notes	Economic Accessibility	Alternative Route
Esja	~50 minute bus, #15 and 57	250m to stop short walk to trail	None	Local bus pass	~30 minute drive
Hveragerði	~1 hour bus, #3 and 51	700m to stop 4 km to trail	Walk through streets to trail	Local bus pass + 940 ISK	~45 minute drive
Heiðmörk	~35 minute bus, #5	1/4 km to stop 2 km to trail	Nice walk through Rauðhólar to trail	Local bus pass	~30 minute drive
Viðey	1 minute bus, #11	600m to stop short walk to ferry	Ferry to island	Local bus pass + 1600 ISK ferry	~15 minute walk to Harpa
Elliðaárdalur	19 minute bus, #17	900m to stop 300m to area	None	Local bus pass	~15 minute drive
Öskjuhlíð	4 minute bus, #18	500m to stop	None	Local bus pass	~10 min drive
Burfell	40 minute bus, #1 and 21	750m to stop 6 km walk to trail	Long walk along road to trail start	Local bus pass	~20 min drive
Hengill	not bus accessible	4+ hours walk	Very long walk	Local bus pass	~45 minute drive

***Table 1**. Assessment of destination accessibility for eight hikes around Reykjavík.*

Once we selected the hikes that we considered representative of those accessible to visitors in the center of Reykjavík, we planned and executed the hikes. Each of the six we attempted is described briefly below along with representative observational and classification results.

Hike 1: Mt. Esja

For our first hike, our team journeyed to Mt. Esja. Our trip began with a 45-minute bus ride from the center of Reykjavík requiring one transfer from the number 6 bus to the number 57 bus at the Ártún bus stop. On this hike, the destination accessibility was impacted primarily by equipment and operational factors. The equipment factor of our trip was the vehicle, specifically the two busses we took. The operational factors had more of an impact on the destination accessibility of Mt. Esja though. Although the number 6 bus ran every fifteen minutes or so, the number 57 bus ran once every two hours. This meant we had to carefully orient our schedule around its arrival and departure. The infrastructure factor of this location was ideal, with roads that brought us straight to the trailhead. Once we arrived at the trailhead, we found the sign shown in **Figure 8**. It was written in both English and Icelandic and described the various trails at the mountain. It had a very detailed map showing the relative difficulty and length of each trail. A color-coding system was in place on the map and the trail markers to show which trail we were on.


Esjubrún
Varða
Ofan Gunnlaugsskarðs
Steinn
Fjallaleið
Neðan Gunnlaugsskarðs
Vað
Skriðan
Brú
Sjónarhóll
Saudagil
Bjarkarlundur
Esjustofa
Mógilsá
Fjallaleiðir
Mountain Paths
F1 Steinn - Varða
7km
Varða
Steinn
Vað
2-3
klst/hrs
Brú
Brú
Bjarkarlundur
Esjustofa
F2 Kögunarhóll
6,3km
Fjallaleið
Skriðan
Vað
1-2
klst/hrs
Sjónarhóll
Brú
Saudagil
Bjarkarlundur
Esjustofa
F3 Fjallaleið um Gunnlaugsskarð
10,6-
10,8km
Ofan G.skarðs
Neðan G.skarðs
Esjubrún
Fjallaleið
Varða
4-5
klst/hrs
Skriðan
Steinn
Sjónarhóll
Brú
Saudagil
Bjarkarlundur
Esjustofa

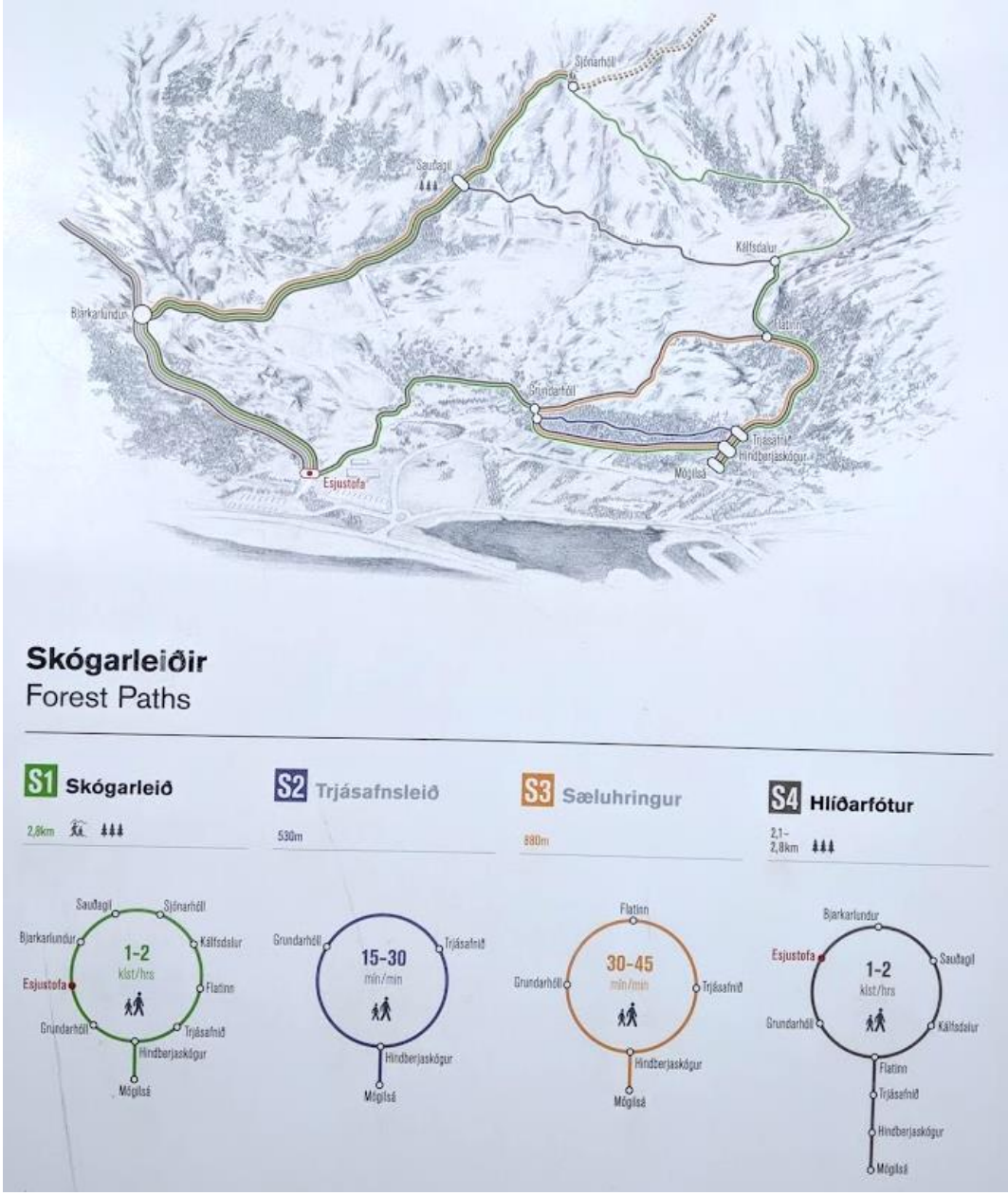

Figure 8. *The map at the base of Mt. Esja.*

At the beginning of our hike, the trails were very well defined and clearly marked. The signs had a smaller map of the mountain with a number showing where we were. The terrain was steep and became progressively rockier the higher up we went. After only half an hour of hiking, we found a fantastic view of Reykjavík.

The closer we got to the top, the more problems we started to encounter with the trail markings. Brightly colored wooden posts and clear paths through vegetation gave way to faint spray-paint markings and indistinguishable rocks. Despite our best efforts, we lost the trail several times. **Figure 9** shows good quality trail markers towards the base of Mt. Esja and the poor quality of

trail markers farther along the trails. The first two pictures show wooden posts displaying bright colors and representing multiple trails. Although these colors were bright to us, one in twelve men and one in two-hundred women experience some form of colorblindness and would not view the colored posts as we did (Johnston, 2019). The second two pictures show a poorly marked crossroads and a thin scratch on a rock serving as a trail marker, respectively.

Figure 9. *Examples of trail markers on Mt. Esja.*

Another challenge presented itself when we looked to trail signs for guidance. None of the signs on the trail were written in a language we could understand. As international tourists, we found it confusing to interpret signs that were written only in Icelandic. **Figure 10** shows two of these

signs that we encountered during our hike. Although the pictures on some signs were slightly helpful, we were unsure if what was written on the signs was important safety, trail marking, historical or another type of information.

Figure 10. *Signs along the trails of Mt. Esja.*

From a physical accessibility perspective, the Esja trail was certainly a demanding hike, but not beyond the ability of an average person who is physically fit and accustomed to hiking 5-7km. Hiking boots are strongly recommended because of rocky terrain, though we did observe several people complete the trail in sneakers. Rain gear is also recommended, as the descent from the mountain could take several hours in the event of a storm.

Hike 2: Hveragerði Hot Springs Trail

The second hike we went on was the Hveragerði Hot Springs Trail. We took the number 5 bus to the Mjödd bus stop, and then the number 51 bus to the Hveragerði-Shell stop. This took us 60 minutes in total. These busses again represent the equipment factors of destination accessibility and functioned fine for our purposes. The aspects that needed improvement were the infrastructure and operational factors of destination accessibility. The infrastructure component was lacking, due to there being no bus stops near the trailhead. The operational factor was also not ideal because the number 51 bus ran every 2 hours. Even from the final bus stop, it was a 4km walk to the trailhead. We had found written instructions and GPS coordinates on the internet the night before, so we were confident in our ability to reach it. Unfortunately, there were only a few signs directing us towards the trail on the edge of town, and our navigation

services were unable to give us directions. Our written instructions were too vague to navigate by. Ultimately, we failed to even reach the trailhead. Considering that Hveragerði is only an 8km hike, these factors made the trail inaccessible, at least to those of average hiking ability like us.

Hike 3: Heiðmörk Nature Reserve

Our third hike took place in the Heiðmörk Nature Reserve. We took the number 5 bus to the nearest stop to the reserve, called Bugða/Kambavað. This bus stop was located in a residential area, and there were paved paths located nearby that led to the trailhead. From there, our team walked 2km to the trailhead, which took us approximately 30 minutes. From there, we hiked the blue trail, a 7.5km trail loop in the reserve. We chose this particular trail because it was the closest one to the bus stop. We did not mind the short walk to and from the trailhead, as it was through a beautiful area called Rauðhólar. The destination accessibility was impacted minorly by the operational factor of the bus schedule, but the bus ran every fifteen minutes and was not difficult to plan around. As for the infrastructure factor of destination accessibility, we were impressed that there was a bus that took us so close to the trailhead and a paved path leading us the rest of the walking distance.

Once we began hiking the trail, we noted that every sign that had text descriptions on it was written in both Icelandic and English. An example of the descriptions can be found in **Figure 11**.

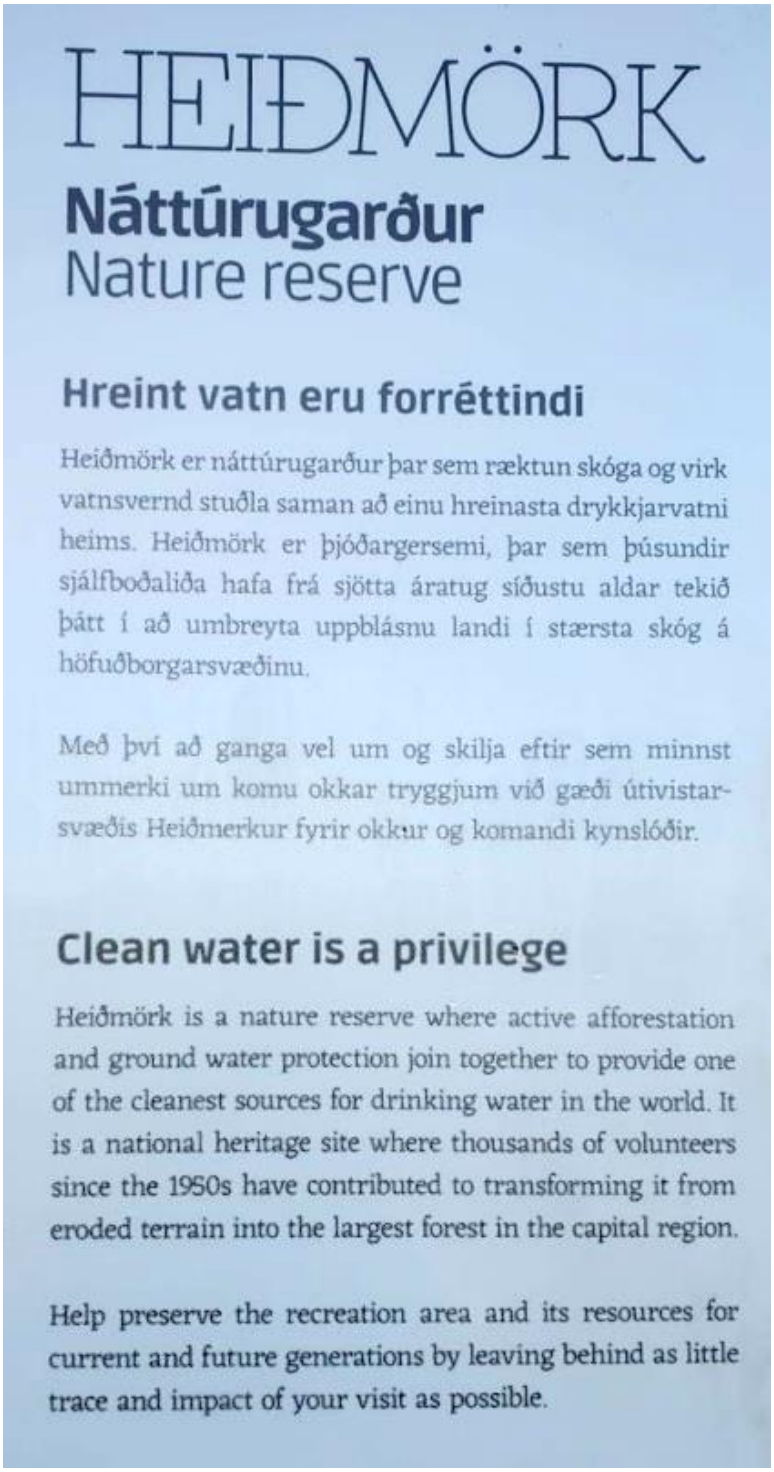

Figure 11. *Informational text in Icelandic and English at Heiðmörk.*

The symbols on the map were simple and universal. Additionally, the labels for each symbol were written in Icelandic and English. The explanations of each symbol are shown in **Figure 12**.

Figure 12. *Legend of symbols in both Icelandic and English at Heiðmörk.*

Another observation was how well-marked each trail junction was. **Figure 13** shows a signpost similar to the ones at every trail junction. The trail marking posts were very visible in a bright red color. Again, a person with colorblindness would not have the same experience we did. There were also arrows pointing from the posts that are marked with a particular color corresponding to each trail. This format of trail marking seems very easy to understand, even for international tourists such as ourselves.

Figure 13. *A trail marker showing the divergence of the blue and green trails at Heiðmörk.*

Heiðmörk was an almost entirely flat hike, with a few minor changes in elevation. Most of the trail itself was gravel, while the walk to the trailhead took place on either paved road or sidewalk. The rare parts of the trail that were dirt were extremely well maintained and easy to hike, or even bike. It was entirely possible to hike this trail in sneakers and street clothes.

Hike 4: Viðey Island

The next hike our team completed was on Viðey Island, which is located off the coast of Reykjavík. Viðey is reachable by ferry from multiple harbors throughout the day. A ticket costs 1,600 Króna ($12.85) and the ride lasted fifteen minutes. The equipment factor of destination accessibility was the ferry we took to the island. The operational factor was sufficient as well, with the ferry arriving every hour to go to and from the island for the majority of the day. The infrastructure factor of this destination was the harbor, which we found to be high quality. Both the ticket office and the cafe on the island had trail maps available. The maps were written in both English and Icelandic, providing information on ferry times, landmarks, and trails.

There was a cafe near the center of the island close to the landing dock. From here, several branching trails are available that any hiker could follow. We followed a trail that went around the perimeter of the island. This trail was overgrown with grass and very muddy, but also easily identifiable. The tall grass did obscure many of the trail marking posts, which would have been a larger issue had the trail not been obvious. There were relatively few elevation changes which made for a leisurely hike.

However, once we began hiking the trail, we found the trail's markings and signs poorly kept and unclear. While the path was easy to follow itself, the trail markings often had faded paint and blended in with the surrounding tall grass. This made it more likely to accidentally walk off the trail, which was especially dangerous on the island. One of our team members ventured off the path and repeatedly found that the long grass concealed deep holes in the ground. Many of the signs were also in disrepair, as shown in **Figure 14**. There was also very little signage. As **Figure 15** shows, simple markers with Icelandic names pointed out trails. Even though we encountered several of these signs, they did not exist at every trail junction.

Figure 14. *Broken sign on Viðey Island.*

Figure 15. *Trail sign on Viðey Island.*

The hike itself was beautiful, easy, and brief. In order to hike Viðey Island, one could wear sneakers and street clothes, though warm and water-resistant shoes and clothing are advised because the island can be windy and wet. After days of rain, which are typical in Reykjavík, the trails become almost completely flooded with puddles, in which case we strongly recommend water-resistant shoes or boots.

Hike 5: Elliðaárdalur

We traveled to Elliðaárdalur, an island between two rivers in Reykjavík. We took the number 3 bus to Blesugróf and walked a few minutes to one of the many entrances. This was quite accessible in terms of destination. The equipment was again the bus we rode on. The operational factors were not very impactful with the bus arriving every fifteen minutes. The infrastructure took us straight to the trailhead though. Just before the river, the sign in **Figure 16** greeted our group.

Figure 16. *A map of Elliðaárdalur, entirely in Icelandic.*

As American tourists, we were unable to understand this map. Every point is in Icelandic and we failed to determine even our current position. We began walking and immediately ended up missing a turn into the main area of the island. As is shown by our GPS route in Appendix G, we turned around on the path and walked back towards the island. Quickly we realized there was no danger of getting lost in this area, so markers were not required. However, with English maps or arrows at crossroads like the one shown in **Figure 17**, our group would not have missed the turn and would have taken a different path through the island.

Figure 17. *Crossroads at Elliðaárdalur with no markings.*

Hike 6: Öskjuhlíð

Öskjuhlíð is a natural area located near the Reykjavík airport. It has trails through forests and is known for hiding bunkers from World War II and housing a large population of wild rabbits. Our group traveled here by the number 13 bus and walked less than 100m from the bus stop to the trailhead. The location was very accessible because the bus arrived every fifteen minutes at the nearest stop. The infrastructure in the area also led nearly straight to the hike location. On the trail, the first sign we encountered is pictured in **Figure 18**. As is shown, one side of the sign was in English and the other was in Icelandic. The sign also contained interesting information on historic locations in the area.

Figure 18. *Icelandic and English signs from Öskjuhlíð.*

The map on this sign was helpful in making a plan for the hike, but a lack of trail markers prevented us from following this plan. We inadvertently traveled south, as can be seen in Appendix H, before realizing and having to turn around. We did not encounter a single trail marker on our entire hike, making it difficult to stay on the path we wanted. The map was difficult to understand. The light blue markings on the map represent historical structures and

paths, but the orange markers were not explained on the sign. While our group found this data interesting, it hindered our understanding of the map.

4.2 Understand current practices for creation and maintenance of trails

To gain more insight into the upkeep and construction of trails, we met with a director at the Environment Agency of Iceland's (UST). From our interview, we learned that the UST constructs and maintains all trails in Iceland's national parks and reserves. Hiking trails outside these locations are maintained by a variety of private hiking clubs. The director we interviewed emphasized that within the UST, certain standards are used when constructing a new trail or making a sign. Standards for constructing a new trail were taken from a Scottish handbook titled Upland Pathwork: Construction Standards for Scotland. These standards emphasize the importance of preserving the natural area and using as little outside resources as possible when making a trail. The handbook also prioritizes the continuous upkeep that needs to take place in order to combat damage done to signs and trail markings by the weather.

In addition, we reached out to two other organizations related to our research: Icelandic Search and Rescue (ICE-SAR) and Ferðafélag Íslands (FÍ). ICE-SAR helps locate and rescue hikers in peril, and FÍ is a private hiking club that maintains huts and trails around Iceland. We were unfortunately unable to meet with representatives from either of these groups. However, they are both important figures in the Icelandic hiking community.

4.3 Evaluate international hikers' perceptions of each trail

When possible, we interviewed hikers on or around the trails. In all, we interviewed thirteen hikers and one restaurant worker to hear other perspectives. Multiple factors made it difficult to conduct more interviews. For example, due to the day of the week and being in Iceland during tourism's low season, there were relatively few people on all of the trails we hiked. A significant portion of them were either trail running or mountain biking, and unwilling to stop for an interview.

Mt. Esja was one of the more popular trails where we surveyed hikers and provided us with eight of our thirteen interviews. Although we didn't ask, every hiker told us that they thought Mt. Esja was beautiful. Six hikers we consulted encountered difficulty navigating the trail at some point due to insufficient trail markers. Of those that had trouble, about half said the last section of the trail was difficult. We determined this to refer to the portion of the trail between the last sign and the summit, which was called a rock scramble. Furthermore, half of the participants mentioned that the signs were only written in Icelandic, which was a problem as most of the hikers we talked to did not understand the language. Interestingly, one of them volunteered that he could read Icelandic and found the signs completely useless for navigation.

As with Mt. Esja, the 6 hikers we interviewed on the island of Viðey universally said it was beautiful. The majority of hikers we talked to considered Viðey's hiking trails to be in poor repair, citing trail markers that were difficult to see, damaged signs, and flooded trails. One woman didn't even realize that there were trail markers, despite spending several hours on the island. Even with the condition of the trails, nobody reported problems navigating. Hikers mentioned that the relatively small size of the island, the open landscape, and the obvious trails made it difficult to get lost, even if there were few markings.

4.4 Identify the strengths and weaknesses of each trail

Each trail has its own unique strengths and weaknesses. This is in large part due to trails in Iceland being managed by a wide variety of governmental agencies and private clubs, each following its own standards. In our experience, this difference in management was clearly apparent in the quality of trail markings and signs. Below in **Table 2**, there is a brief overview of the hikes we attempted and our ratings on different criteria we looked for. Each criterion is defined below and was developed based on our background research and our experiences of the trails.

Website Information: This category refers to the amount of information available online for each hike. A score of 1 represents little to no information, while a score of 5 represents an up-to-date, detailed description of the trail's location, difficulty, and amenities maintained by an official organization. Also considered in this score is the availability of this information in multiple languages.

Destination Accessibility: Here destination accessibility refers to the ease with which a hiker can visit the location, measured from central Reykjavík. A score of 1 is used for a site that is more than an hour's walk from a road or bus stop and has few locations for parking, while a score of 5 is used for a site that is less than a 30 minute walk, or one easily accessible by public transportation. A site must also have plenty of available parking to earn a score of 5.

Trail Condition: Trail condition is the physical quality of the trail. This includes factors like level and width, as well as if a trail is overgrown or flooded. A score of 1 represents an overgrown, unlevel or narrow trail, while a score of 5 is used for a well-kept, level trail.

Trail Difficulty: Trail difficulty refers to the physical difficulty of the trail. A score of 1 represents a mostly flat, paved trail, while a score of 5 is reserved for exceptionally physically challenging hikes.

Trail Markings: This category rates the collective quality of markings along a trail. A score of 1 is used for a trail with numerous unmarked crossroads or markers infrequent enough to cause confusion among hikers. A score of 5 is the opposite: every branch and crossroads is marked clearly and markers are reasonably frequent.

Signage: Signage refers to the quality and frequency of signs and maps along the trail. A score of 1 represents illegible or unhelpful signs that are infrequently placed, while a 5 represents clear signage placed reasonably frequently. Also included in this criterion is the languages each sign is printed in.

Services: This category refers to the availability of services at the trail. A score of 5 is earned by a trail with an information center, cafe, or similar amenities.

Monetary Cost: Monetary cost is the cost required of the hiker to visit the trail. This criterion is rated in dollar signs ($). A single dollar sign represents a free trail within walking distance of central Reykjavík. A score of five dollar signs is used for a trail that would cost the hiker upwards of 2500 Króna to visit. For reference, at the time of this report's publication, two regular bus fares in Reykjavík is 940 Króna.

Required Hiking Gear: This is what gear is recommended or required for a trail. This criterion is rated between minimal, moderate, and extreme. A minimal trail requires no special equipment, and the authors of this report recommend street clothes, closed-toe shoes and a water bottle. An expert trail requires hiking boots and the authors recommend light athletic clothes and layers to accommodate for weather.

	Esja	Hveragerði	Heiðmörk	Viðey	Elliðaárdalur	Öskjuhlíð
Website Info	4	**5**	3	**5**	2	2
Destination Accessibility	4	2	4	4	**5**	**5**
Trail Condition	4	N/A	**5**	4	4	**5**
Trail Difficulty	4	N/A	2	**1**	**1**	**1**
Trail Markings	2	N/A	**5**	2	**1**	**1**
Signage	2	N/A	**5**	2	**1**	2
Services	**5**	4	2	**5**	3	3
Monetary Cost	$$	$$$	$$	$$$$	$$	$$
Required Hiking Gear	Moderate	N/A	Minimal	Minimal	Minimal	Minimal

***Table 2**. Scores earned by each hike.*

4.5 Discussion

From reviewing our data, we found emerging trends that confirm some of our initial impressions while hiking. On the one hand, from Reykjavík, there is a wide range of opportunities and experiences when it comes to hiking. On the other hand, trail markings and signs have unreliable quality. The signs were consistently written in Icelandic, but inconsistently in English as well. Additionally, signs and markings were often absent at key trail junctions.

From both our participant observations and semi-structured interviews with hikers, we confirmed major inconsistencies in the quality of trail markings, as well. There did not appear to be an established standard of signage or location of signs across all of the hikes we evaluated. Furthermore, there were major inconsistencies between trails regarding which language the signs

used. Some signs were written in both English and Icelandic, but they were in the minority. Most signs we encountered were only written in Icelandic, which is an issue for foreign tourists who rarely speak the language.

In terms of destination accessibility, we found that a majority of the trails in the Reykjavík area are difficult to reach without a car. Most advertised trails are not directly accessible by public transportation and require anywhere between a few minutes and several hours of walking to reach the trailhead. Tourists, who often have limited time to spend in Iceland, do not want to spend as much time getting to a trail as they spend hiking it. Destination accessibility is a primary issue in the accessibility of hiking trails near Reykjavík.

5.0 Recommendations and Conclusion

We have five major recommendations based on our results. Implementing the recommendations would improve the accessibility of hiking trails in the Reykjavík area to international tourists.

5.1 Recommendations

For implementation through existing organizations or volunteers:

Adopt a standard that is universally accepted and understandable for hikers of different nationalities for all trail markers and signs

A universal standard would make hiking in the area not only simpler for tourists, but also for local visitors. One universal standard would promote the accessibility of hiking trails to tourists through consistency. Once a hiker has explored a trail, they would know what to expect and how to proceed on any subsequent trail they choose to hike. This could encourage tourists to engage in this type of nature tourism in a safe and responsible manner. We found that the standards in the Upland Pathwork: Construction Standards for Scotland handbook are comprehensive, and could be used across Iceland. These standards are currently used by the Icelandic UST, but the UST only creates and maintains trails in national parks and reserves. This handbook can instruct any hiking club or organization on how to design a high quality trail.

Use both English and Icelandic for all trail maps and signs

Signs should be posted in two languages: English and Icelandic. However, signs were frequently written in only Icelandic. This presents a problem for international tourists that do not speak or understand this language. We recommend signs be posted in English as well as Icelandic because approximately 45% of visitors to Iceland come from native English-speaking countries (Icelandic Tourist Board, 2018). In addition, it is likely that many more visitors read English at some level of understanding.

Use color codes for all trail markers

Both from our own observations and from our interviews with other international hikers, we realized that it is not an uncommon occurrence to get lost on a trail due to poor markings. We strongly encourage having obvious and bright trail markings at every junction on a trail, identifying separate paths that cross. We recommend that each trail be assigned a color and that all trail markings for that trail be in that color. Several hikes we went on used this technique, but one executed it poorly. To accommodate hikers with colorblindness, symbols such as shapes could be used in addition to trails marked with color.

Develop signs and markers that have long term resilience

We encountered many signs and trail markers in poor condition. Many were so damaged from weather or vandalism that they were completely illegible. The signs and markers have to be able to endure the heavy precipitation that is typical of Iceland. We recommend that trail signs be evaluated on a yearly basis to see if they are still intact and legible.

Looking forward:

Complete a hiking trails project in the 2020 academic year that organizes a conference of hiking stewards across Iceland to discuss standards of trail maintenance

We recommend that the creation of a hiking stewards conference be taken on as a project next year (2020) as a part of the WPI Reykjavík Project Center. Ideally, this project would orient itself around the fact that there is no national standard that is enforced for trail maintenance and accessibility. The future research project could focus on organizing a conference and identifying key attendees, as well as a thoughtful agenda, where all aspects of trail development, marketing, advertising, and maintenance could be discussed on a yearly basis.

Identify a sponsor for continued research and implementation

Identifying a local sponsor is critical to its success. Many hiking clubs and organizations exist that could benefit from the continuation of this research project. Ferðafélag Íslands is a local hiking club that maintains some of the trails near Reykjavík. Another organization that could make a suitable sponsor is the Environment Agency of Iceland. They create and maintain trails in the national parks and reserves across Iceland. A third contender is the Icelandic Search and Rescue. This group is familiar with local trails because they rescue lost hikers on the surrounding recreation areas.

5.2 Conclusion

Because 12% of Iceland's GDP comes from the tourism industry, it is vital to prioritize planning how Iceland's natural environments are made accessible to international visitors (Arion Research, 2018). Iceland's trails are managed by a variety of private clubs and governmental organizations, with each following their own standards. The differences in trail standards and management are reflected in the quality of maintenance, style of signage, and overall accessibility of the trails. While the differences in the geography of each trail must be taken into account, hiking in the Reykjavík area can be made significantly more accessible by the adoption of universal standards.

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Appendix A

Below is an informed consent paragraph and interview topics on trail maintenance and upkeep, as well as trail signs and markings. We asked about these topics to representatives from organizations in the local hiking community.

Informed Consent Statement

You are being invited to participate in a research study titled A Pilot Study to Assess the Accessibility of Southwest Iceland's Hiking Trails. This study is being done by Gabriel Katz, Nicole Jutras, Smith Edwards, and Jesse Abeyta from Worcester Polytechnic Institute. You were selected to participate in this study because you are familiar with the hiking trails in the Reykjavík area and are above the age of eighteen. The purpose of this research study is the accessibility of the hiking trails in southwestern Iceland. If you agree to take part in this study, you are agreeing to be interviewed by some of our team members. This interview will ask you about your knowledge on the accessibility of hiking trails in Reykjavík and its surrounding areas. It will take you approximately 10-15 minutes to complete. You may not directly benefit from this research; however, we hope that your participation in the study may improve the accessibility of the hiking trails in Reykjavík and surrounding areas. To the best of our ability, your answers in this study will remain confidential. We will minimize any risks to breach of confidentiality by not recording your name or any specifically identifying information in this interview.

Your participation in this study is completely voluntary and you can withdraw at any time. You are free to skip any question you choose.

If you have questions about this project or if you have a research-related problem, you may contact the researcher, Nicole Jutras at ncjutras@wpi.edu. If you have any questions concerning your rights as a research subject, you may contact the Worcester Polytechnic Institute Institutional Review Board or email irb@wpi.edu.

By verbally consenting to being interviewed, you are indicating that you are at least 18 years old, have read and understood this consent form, and agree to participate in this research study. Please reach out to Nicole Jutras at the email listed above if you would like a copy of this form sent to you. Please DO NOT state your name or any identifying information.

Interview Questions

How we plan on introducing ourselves to potential participants: "Hi, my name is _____ . We are interviewing you because you are familiar with the hiking trails in the Reykjavík area and contribute to the creation and upkeep of signs and trail markings."

Maintenance and Upkeep

- Trail maintenance responsibilities

- Trail maintenance frequency

Signage and Trail Markings

- Signage language standards
- Signage placement standards
- Icelandic satisfaction with signs
- Tourist satisfaction with signs
- Standard marking system

Appendix B

Below is an informed consent paragraph and interview questions on a specific hike and past hiking experience. These questions were asked to other hikers on the trails we traveled.

Informed Consent Statement

You are being invited to participate in a research study titled A Pilot Study to Assess the Accessibility of Southwest Iceland's Hiking Trails. This study is being done by Gabriel Katz, Nicole Jutras, Smith Edwards, and Jesse Abeyta from Worcester Polytechnic Institute. You were selected to participate in this study because you are currently hiking in the Reykjavík area and are above the age of eighteen. The purpose of this research study is the accessibility of Iceland's hiking trails. If you agree to take part in this study, you are agreeing to be interviewed by some of our team members. This interview will ask you about your opinions on the accessibility of hiking trails in Reykjavík and its surrounding areas. It will take you approximately 5-10 minutes to complete. You may not directly benefit from this research; however, we hope that your participation in the study may improve the accessibility of the hiking trails in Reykjavík and surrounding areas. To the best of our ability, your answers in this study will remain confidential. We will minimize any risks to breach of confidentiality by not recording your name or any specifically identifying information in this interview.

Your participation in this study is completely voluntary and you can withdraw at any time. You are free to skip any question you choose.

If you have questions about this project or if you have a research-related problem, you may contact the researcher, Gabriel Katz at gakatz@wpi.edu. If you have any questions concerning your rights as a research subject, you may contact the Worcester Polytechnic Institute Institutional Review Board or email irb@wpi.edu.

By verbally consenting to being interviewed, you are indicating that you are at least 18 years old, have read and understood this consent form, and agree to participate in this research study. Please reach out to Gabriel Katz at the email listed above if you would like a copy of this form sent to you. Please DO NOT state your name or any identifying information.

Interview Questions

How we plan on introducing ourselves to potential participants: "Hi, my name is _____ . We are interviewing you because you are hiking on trails in Reykjavík or in surrounding areas and we would like to hear about your experience."

Current Hike

What trail or path did you take today?

Did you have any trouble on the trails?

Were you able to read most of the signs on the trail?

What is your native language?

Were the signs written in a language you could understand?

Was the trail sufficiently marked? Was it easy to find your way?

Did you ever lose sight of the trail?

Past Hiking Experience

Would you consider yourself an experienced hiker?

How often do you hike in Iceland?

Compared to other trails you have hiked, how accessible did you find this one?

What specific features made this trail more or less accessible than other trails you have hiked?

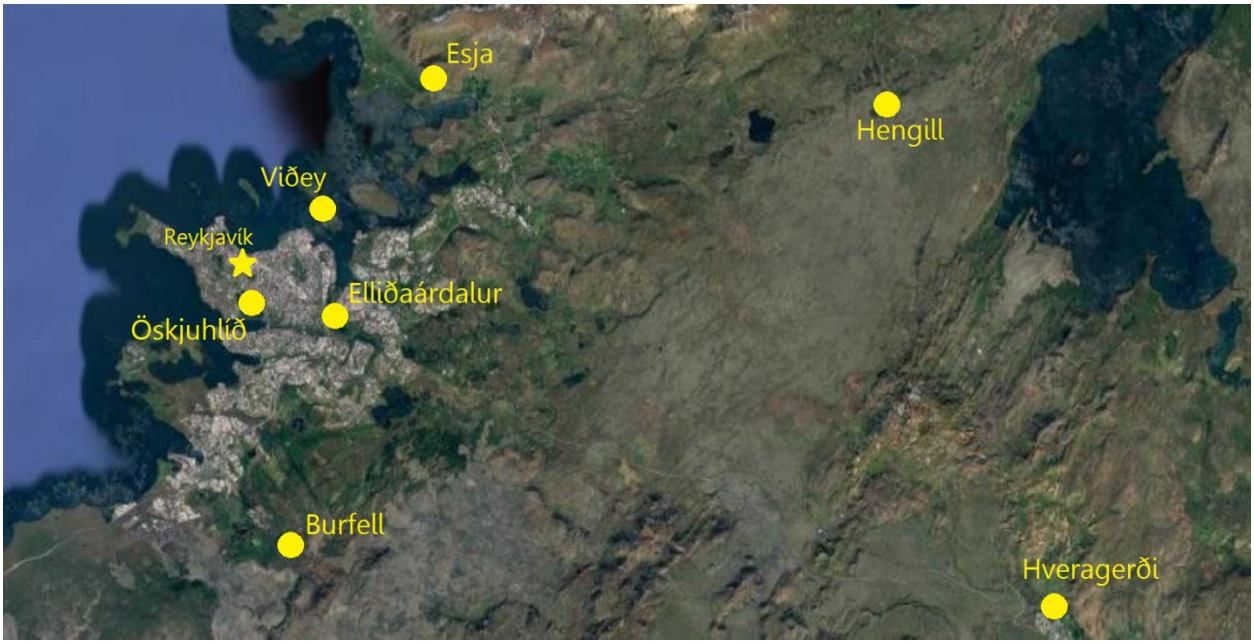
Appendix C

This checklist identifies if each trail we hiked meets certain criteria. If the particular hike meets the criterion in the leftmost column, the corresponding box is colored green. If not, the box is shaded red. If there was not enough data collected or if a particular criterion is not applicable to a trail, it is marked in gray.

	Esja	Hveragerði	Viðey	Heiðmörk	Elliðaárdalur	Öskjuhlíð
Mostly paved						
Multilingual signs						
Signs on trails have maps						
Trail markings						
Accessible by public transportation						
Less than 1 hour walk to trailhead						
Extra expenses required						
Mostly flat						

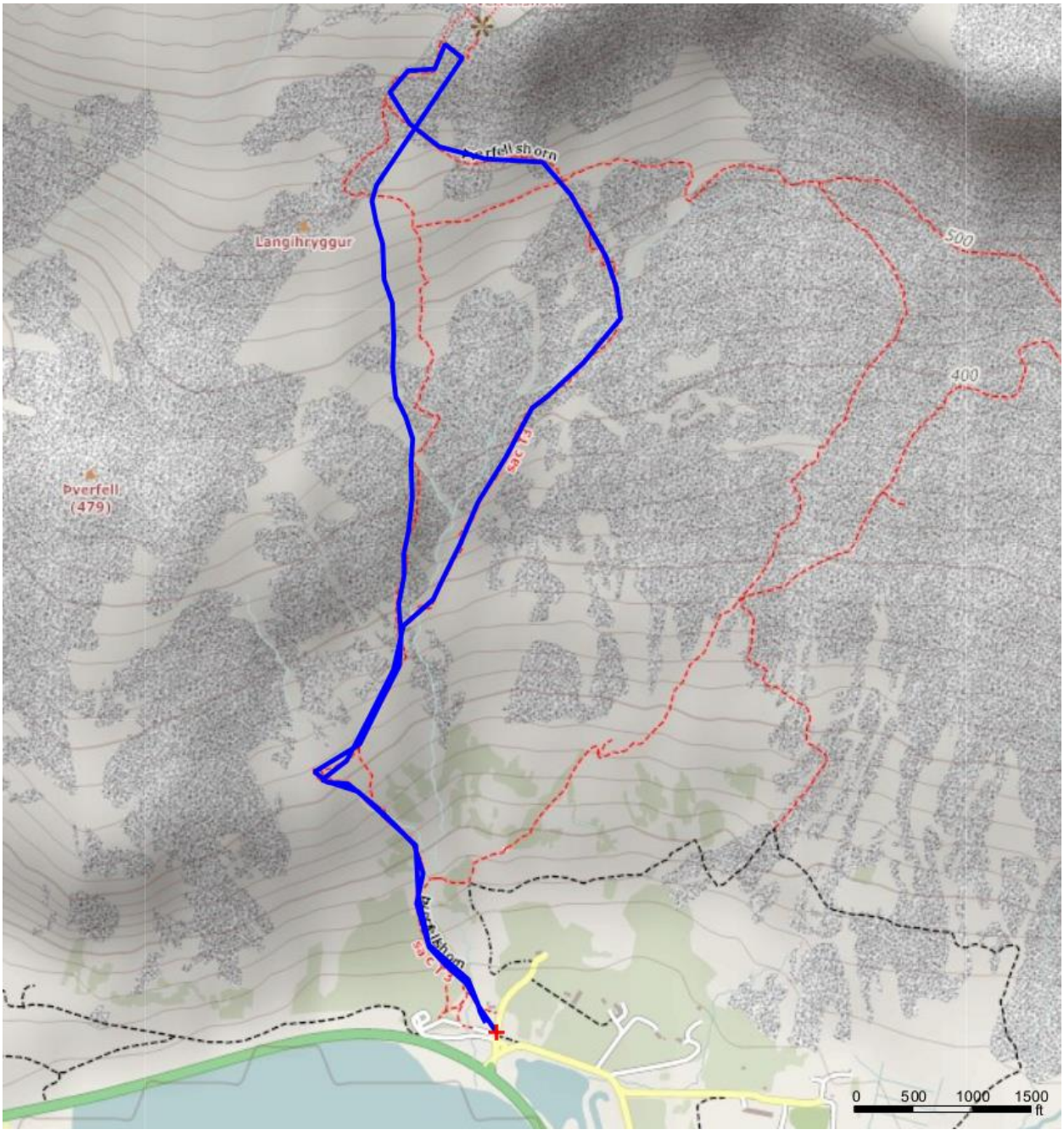
Appendix D

The map depicted below shows the Reykjavík area. Each yellow dot represents a location where we investigated a hike. The yellow star shows the location of downtown Reykjavík.



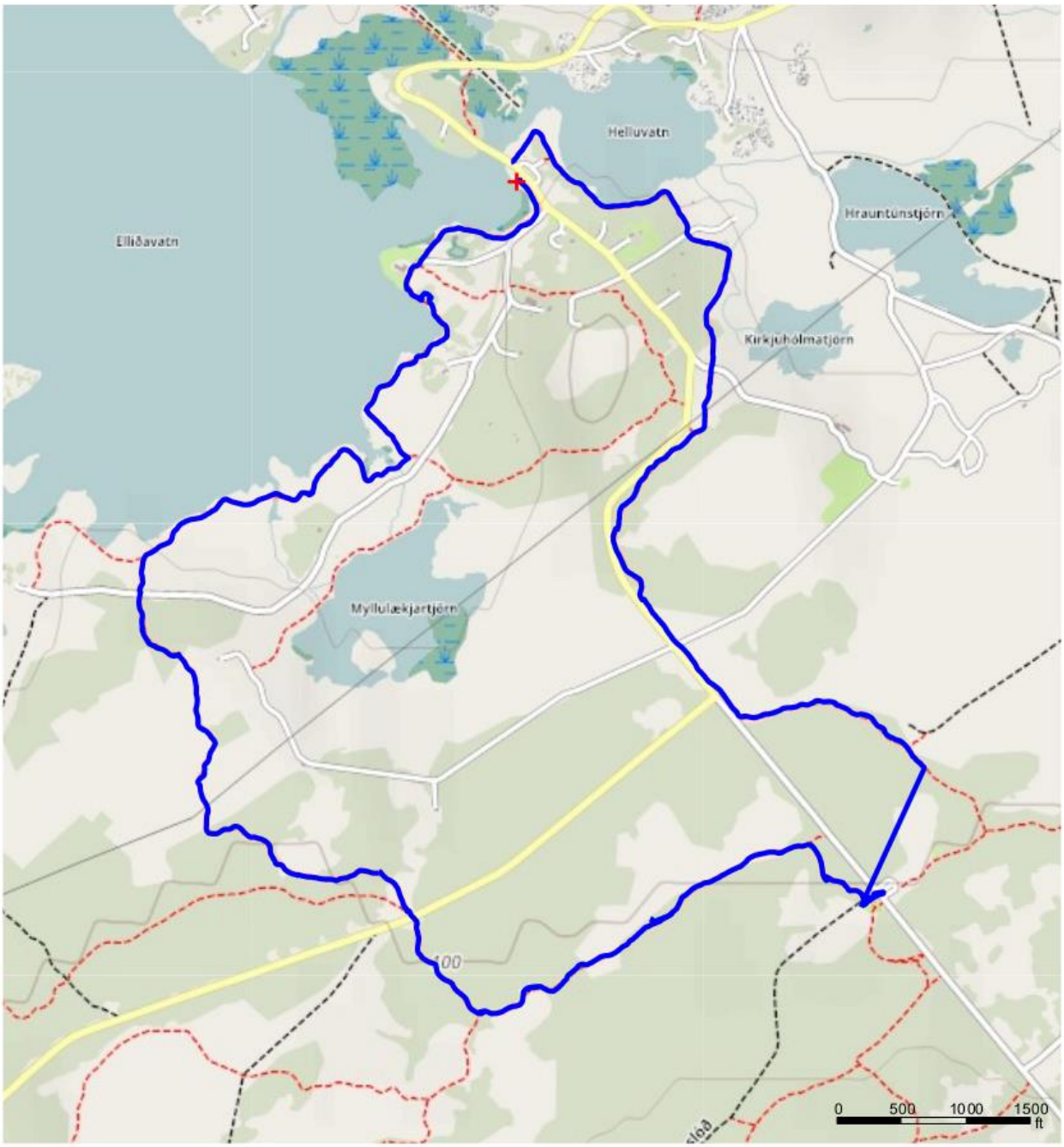
Appendix E

This map shows the route we hiked during our visit to Mt. Esja.



Appendix F

This is the trail we hiked at the Heiðmörk nature reserve.



Appendix G

This is the route our group traveled on Elliðaárdalur. Towards the top left of the route is where our group turned around, realizing we were going the wrong way. However, the route shows how we arrived at the same location regardless and turned off the horizontal path back towards the island.

Appendix H

This map shows the route we traveled through Öskjuhlíð. We had intended to go to the northern section first, but inadvertently ended up hiking south. Once we realized this, we made the wide turn at the bottom of the route and traveled back to the northern part of Öskjuhlíð.