LAPIN AMK
Lapland University of Applied Sciences

AN OVERVIEW OF TRAILS AND TRAIL SIGNS IN OUTDOOR RECREATION

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Abstract of Thesis

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This thesis analyses the possibility of having an international trail system and trail signs system. To seek the answers for the main question, the research was executed in certain regions in Utah, USA, which stand out for outdoor recreation. The research also focused on warning signs which the commissioner especially wanted to have a better understanding of.

The research topic deprived mainly from the demands of more academic research on the subject and the author's personal interest in visual art and outdoor recreation. Qualitative methods were used: content analysis, structured and unstructured interviews. Interviews with trail experts such as State Park's ranger, trail supervisors, and information specialist were conducted, aimed to create holistic views on the implementation of trail and trail signs in those destinations.

The main results of the research show that to have a common trail system would require cooperation from various destinations, either regionally or nationally. The trail sign system is developed based on the trail, therefore, in order to develop a common trail sign system, a common trail standard system must be developed first, so divergences in the trail signing system can be avoided. Formatting, signal words, color, etc. all play a role in increasing sign's conspicuity. Traditional training methods are still being used popularly as a way to educate trail users. Despite the development of new technology, on-site cannot be replaced, but be presented under various of forms and materials. In the near future, it is expected to see more technology devices get to applied in outdoor recreation context as a means to communicate safety message to trail users.

Key words outdoor recreation, trail system, trail signs, warning signs, sign design, sign comprehension

CONTENT

1 INTRODUCTION

The decision for choosing the topic of analyzing trail and trail signing developed during the second year of my tourism studies, when the course on safety in tourism industry was introduced. Considering myself as an energetic individual, I spend lots of time outdoors, taking part in outdoor recreational activities, either alone or with a group of people, such as kayaking, river rafting, hiking, outdoor swimming, mountain biking, and fishing. As a matter of fact, while taking part in outdoor recreational activities, I pay lots of attention to personal safety issues.

As I have observed, most outdoor recreational activities take place in nature. According to studies, being in nature brings many benefits to our body and mind (Stanford 2015). Therefore, outdoor recreation's popularity and participation rates have not ceased to gain and develop new forms, as a result of more newly developed leisure activities involving challenges and risks as people search for adventure (Plummer 2009, 1).

One of the key factors in why recreationists participate in outdoor recreations is the excitement and the experience that the activities offer. The fundamental premise of contemporary visitor management is that quality experiences are best assured by providing a range or diversity of setting opportunities. McCool et al. (2007, 50) defines setting as the combination of attributes of a real place that gives it recreational value. Therefore, in order to offer people the best opportunity for various kinds of experiences, managers have to strive to provide different kinds of recreational settings and accommodating different types and styles of recreational use (Clarke & Stankey 1979, 5).

Before taking part in outdoor recreational activities, I usually research the outdoor recreation environment, so that I could better prepare myself mentally and physically for the experience. The research is very important as it also gives me an idea of potential risks, so I could think ahead of rescue solutions in case of accidents. Later, while I am on the trail, I pay a lot of attention to signs and notice boards to avoid getting lost, especially in cell phones dead zones and furthermore and to gain more knowledge on the area's nature habitat.

When I am taking part in outdoor recreational activities that involve trails, I expect the trails to have signs, either at the trail head or along the trail, including information signs displaying trail information: trail length, trail elevation, potential hazards; interpretive signs providing information on the area's animal and ecosystem. Trail signage plays an important part in improving trail user experience by keeping people, vehicles, and property safe as well as conserving and protecting the area's nature. (NYS Office of Parks, Recreation and Historic Preservation Planning Bureau 2015, 4.) However, there are situations that signs do not fully play its role, due to many reasons such as inappropriate putting methods or harsh weather condition-snowstorm. This can be observed clearly while one is taking part in outdoor recreational activities in nature setting.

In summer 2016, I carried out my internship at the county's tourism bureau in the county of Utah, in the state of Utah. The state of Utah is well-known for its landscape and the prosperity in outdoor recreational activities. Carrying out a research on outdoor recreation was promised to be an advantage. The research question was designed to identify the needs of a common trail and trail signing standard in outdoor recreation. The analysis of the trail management system and trail signings system in the USA helped creating the research framework. The research provided insight into the actual needs and requirements of a common trail standard and trail signings, which was gained by the semi-structured interviews with Forest Service's Trail Manager, Utah Trail Committee Member and Utah Valley Visitor Bureau's Information Specialist.

The commissioner of this thesis is Lapland University of Applied Sciences, Multidimensional Tourism Institute, Project "REILA reittimerkinnätturvallisiksi, pilottialueena Lappi". Realizing the importance of having a common trail standard, which allows clear communication for trail management associates and end-users, including foreign users, Metsähallitus, together with Lapland Rescue Services (Lapin pelastuslaitoksen) and The Centre for Economic Development, Transport and the Environment (Elinkeino-, liikenne ja ympäristökeskus, ELY-keskus) and Lapland University of Applied Sciences (LapinAMK) have been working on the project REILA Trail Safety Sign, Lapland area (REILA reittimerkintöjenturvallisuus, pilottialueenaLappi). Finland's State

Forest Enterprise (Metsähallitus) manages all of Finland’s national parks and other state-owned protected areas. Many of those areas are significant nature tourism attractions and outdoor recreation destinations. However, current route marking practices vary considerably throughout the country. The project is hoped to shed lights on a clear, comprehensive trail managing system and signing method (especially warning signs).

2 OUTDOOR RECREATION TRAIL

2.1 Trail History Development

Trails have a long history of development as long as human started moving between places for various purposes. The Federal Trail Data Fundamentals, which was developed by the National Park Service (NPS), the Bureau of Land Management (BLM), the United States Fish and Wildlife Service (FWS), and the United States Forest Service (USFS), defines trail as

> A linear route managed for human-powered, stock, or off-highway vehicle (OHV) forms of transportation or for historic or heritage values. Some portions of historic trails are accessible today, and provide recreational and other benefits, while others, more “virtual” in nature, provide a cultural and/or historic experience, but are not physically capable of being traversed or accessed. Historic trails can consist of a path, a route, a corridor, a road, a river, a stream, etc. (USDA Forest Service 2016, 82.)

Understanding the concept of trail from this point of view, Bardon, Harkin & Meglos (2003, 3) stated that, in early times, trails were built to fulfil humans' practical needs as mentioned above-travel routes to food, water, and shelter. Besides mostly being man-made, trails were also created by animals in their habitats, during migration and daily travels. Trails develop over time accordingly to the development of transportation system. Therefore, trails typically followed the contour of the land, snaked along watercourses, and climbed low mountain passes. Later, the oldest roads began as trails were improved as transportation system progressed from foot, to horse, to rail, and lastly to automobile. In short, trails provide access to natural surroundings where many outdoor recreation opportunities take place.

As discussed in the CRS Report for Congress (Vincent et al. 2004, 63), during the early history of the United States, trails served as routes for commerce and migration. Since the early 20th Century, trails have been constructed to provide access to scenic terrain. In 1921, the concept of the first interstate recreational trail, now known as the Appalachian National Scenic Trail, was introduced.

Later on, in the 1950s, as the nation's population expanded, the nation sought better opportunities to enjoy the outdoors. In 1958, the US Congress established the Outdoor Recreation Resources Review Commission to make a nationwide study of outdoor national recreation needs. (Vincent et al. 2004, 63–64.)

Trails also serve as catalyst for economic development, drawing recreationists and tourists from a distance. Trail users may spend money at local businesses such as accommodation, restaurants, gift shops, while local people may also be employed as guides or in maintaining trails. This has been pointed out by the World Tourism Organization Network–UNWTO (2016) stating that tourism related activities have positive impacts on reducing poverty levels, especially benefit to the poorer group, if tourism is managed with a strong focus on poverty alleviation.

Trails can provide a means of access into the outdoors and a route for people to follow. As with all recreation provision, the trails need to provide a reasonable match between the various visitor requirements and the features that the area has to offer. (Bell 2007, 114). Since most of the outdoor recreational activities take place in nature, trails help to decrease the chance of outdoor recreationists becoming lost, confronting potential physical dangers and damaging sensitive places. In short, trails keep people on the right track by signalling that access is allowed and that the visitor is not trespassing. Trails also act as rallying points for the conservation of cultural and natural heritage activities in a region; environmental and heritage conservation groups can use trails as a focus for fundraising and organizing, and as education tools for encouraging other community members to become more involved in conservation. (Jenkins & Pigram, 2003, 509.)

Developing a common trail standard that reflects all different trail attributes and can be applied either regionally or nationally is a goal that many federal agencies trail management associates have been working on. The main reason behind developing a unified trail data standard is that the system will make it easier for trail information to be accessed, exchanged and used by more than

one individual, agency or group.(Federal Trail Data Standards Team & Geographic Data Committee 2011, 1.)

However, it is crucial to understand that trail signs system are developed and implemented accordingly to the trails. This common standard provides an integrated means to consistently record and communicate the intended design and management guidelines for trail design, construction, maintenance and use. There concepts acting as the cornerstones in trail planning and management that are described below. (USDA Forest Service 2016, 1.)

2.2 Trail Fundamentals

2.2.1 Trail Type

To accommodate user's needs, there is a variety of trails which framework categorizes trails by designed use, the use by which trails are most often identified. Formed on this framework, the US Federal Trail Committee put trails into very clear, concise categories, based on its main surface that is designed and managed to accommodate use on that surface. There are three main trail categories.

The first trail category is Standard/Terra Trail. A trail belongs to this category has surface consisting predominantly of the ground and that is designed and managed to accommodate use on that surface. The next trail category is Snow Trail- a trail that has a surface consisting predominantly of snow or ice and that is designed and managed to accommodate use on that surface. Winter play areas are not included in this category. The third category is Water Trail, these are trails which has surface consist predominantly of water (but may include land-based portages) and that is designed and managed to accommodate water based trail use.

It can be seen that this trail categorization system developed by the Federal Geographic Data Committee divided trails into very clear, concise categories based on its main surface that is designed and managed to accommodate use on that surface. Many trail management associates use the similar approach to categorize the trails which lie under their management authority. The Trail

Types management concepts allows managers to identify trail-specific Design Parameters (see Appendix 1) or technical specifications, management needs, and the cost of managing the trail for particular uses and/or seasons by trail or trail segment. (USDA Forest Service 2016, 1–2.) Using this trail categorization technique, a trail should strictly be placed into one category only, avoiding overlapping in trail information storage. However, in reality, there are situations that trails designed use is modified due to external factors, such as weather and season. It demands to record both of the trails Trail Types when two trails overlap, for example, when a Snow Trail overlaps a Standard Terra Trail, it should be recorded under two categories in the trail information system.

2.2.2 Trail Class

Using the FTDS Trail Class concept, each trail or trail segment can only be identified with one trail class, based on the management intent for the trail or trail segment, which may or may not reflect the current condition of the trail (USDA Forest Service 2016, 2). There are five Trail Classes, ranging from the least developed (Trail Class 1) to the most developed (Trail Class 5), illustrated in table 1 below.

Table 1 Trail Class Divisions (USDA Forest Service 2016, 3-4)

Trail Class 1 – Minimally Developed Based on the Trail Class Matrix's description, I put these trails under the first category- Trail Class 1 because, firstly, the trails show no sign of man-made construction. The tread is intermittent and indistinct with common, naturally occurring and substantial obstacles. There is limited to non-existential constructed features and route identification signings displayed. Recreation environment under this category Trail Class 1 should remain natural and unmodified.	 Figure 1 Ounasvaara Trail in Rovaniemi, Finland (Nguyen 2016)  Figure 2 Trail in Suomenlinna (Helsinki, Finland) (Nguyen 2016)

Trail Class 2–Moderately Developed

Trails recognized under Trail Class 2 category can be distinguished by discernable, continuous, but narrow and rough tread. Along the trail, displayed obstacles remain common and substantial as on trails under Trail Class 1.

Blockages, such as broken trees, rocks, snow are cleared to define route and protect resource (Photo 4). Nevertheless, there might still be vegetation encroached into trail way (Photo 3, 5). Trail structures are of limited size, scale, and quantity. Route identification signing is still limited to junctions, which does not direct trail users to trail head location.

Figure 3 Walking Trail in Rantavitikka (Rovaniemi, Finland) (Nguyen 2016)

Figure 4 Trail in Suomenlinna (Helsinki, Finland) (Nguyen 2016)

Trail Class 3– Developed

Trails fall under Trail Class 3 category have continuous and obvious trails. Along the trail, obstacles still remain common, yet not substantial or intended to provide challenge; vegetation is cleared out of the trail way. Trail structures, such as wall, drainage, steps, and raised trails are more obvious comparing to trails under Trail Class 2 categories.

Route identification and signings are located at junctions to ascertain trail user's safety. Destination signing are likely put at the trailhead, meaning outside the wilderness area. Information and interpretive signs may also be present outside the wilderness. (Photo?) The recreation environment remains natural and unmodified like previous trail classes.

Figure 5 Trail Sign to Bird Tower in Ounasvaara (Rovaniemi, Finland) (Nguyen 2016)

Figure 6 Trail in Ounasvaara in Spring (Rovaniemi, Finland) (Nguyen 2016)

Trail Class 4–Highly Developed

Trails under Trail Class 4 categories are recognized by wide tread, relatively smooth with few irregularities. Obstacles might be present, yet remains infrequent and insubstantial. Also, the trails are clear of vegetation. Therefore, these obstacles should not cause trail users challenges.

Trail structures are frequent and substantial with possible trailside amenities. Along the trails, there is a wide variety of signs likely to be e.g. information signs and interpretive signs. Information on the trail's accessibility is likely displayed at trailhead. Recreation environment that these trails offer might be modified according to the trail's designed use.

Figure 7 Y Hiking Trail (Provo, Utah) (Nguyen 2016)

Figure 8 Y Hiking Trail (Provo, Utah) (Nguyen 2016)

Trail Class 5–Developed

Trail Class 5 includes trail that are fully developed. The tread are wide, firm, stable and generally uniform. Commonly they are hardened with asphalt or other imported material (Figure 9). Obstacles should be totally clear out of the trail way. Trail structures are obvious, substantial; there might be bridges, boardwalk, curbs, hand rails and other trail side amenities.

Along the trail, variety of signs, such as information signs and interpretive signs are displayed to reassure user's safety. Recreation environment on these trails are highly modified to fulfil outdoor recreationist's need.

Figure 9 Trail in BYU Provo Campus (Provo, Utah) (Nguyen 2016)

Figure 10 Trail at Silver Lake (Big Cottonwood, Utah) (Nguyen 2016)

2.2.3 Managed Use

According to USDA Forest Service (2016, 3–4), Managed Use is a mode of travel that is actively managed and appropriate on a trail, based on its design and management. Firstly, it indicates management intent to accommodate a specific use. It is the base ground that directs the trail's design, layout, construction and trail signs to put on the trails accordingly. Secondly, on each trail and trail segment, there can be more than one trail managed use. A trail can be served as hiking trail and biking trail at the same time. Both of the managed use should be recorded in the information system to facilitate trail user in information retrieval process.

The Managed Uses for a trail are usually a small subset of all the allowed uses on the trail, that is, uses that are allowed unless specifically prohibited. For example, on a trail that is closed to all motorized use but open to all non-motorized use, the Managed Uses could be Hiker/Pedestrian and Pack and Saddle. The allowed uses, however, would also include bicycles and all other non-motorized uses. There is a direct relationship between Managed Use and Trail Class: generally, one cannot be determined without consideration of the other. However, not all Trail Classes are appropriate for all Managed Uses.

Managed use proves to be very helpful in trail information retrieval. The main idea of this system is to provide a list of outdoor recreation opportunities the trails offer. Trail users can easily choose the outdoor region/area that they would like to have their outdoor recreation experience, together with the experience that they would like to participate; a list of trails would pop up with detailed information. It makes it easier for trail users to search for trails that suit their interest and intended purpose before taking part in outdoor recreation activities. To illustrate this point, Metsähallitus has made an interactive trail map which features the activities that the trails provide.(USDA Forest Service 2016, 3–4.)

2.2.4 Designed Use

Besides managed use, Designed Use is the single Managed Use of a trail that requires the most demanding design, construction, and maintenance

parameters. According to USDA Forest Service (2016, 9), a trail or trail segment might have many managed uses, yet can be recognized with only one designed use. In order to determine a trail's designed use, it is important to consider all Managed Uses that occur during all seasons of use of the trail or trail segment. In some situations, when there is more than one Managed Use identified for a trail, the Designed Use may be readily apparent. For example, on a trail with Managed Uses of all-terrain vehicle and motorcycle, all-terrain vehicle use would be the Designed Use because this use requires wider tread widths and has lower tolerances for surface obstacles and maximum trail grades.

However, there are situations involving more than one Managed Use and the Designed Use may not be obviously apparent. As an example, on a trail that is actively managed for hiker and pedestrian, pack and saddle, and bicycle use, pack and saddle use would likely be the Designed Use because of the three Managed Uses, pack and saddle use generally has the most limiting design requirements. While the Bicycle Design Parameters are very similar to the Pack and Saddle Design Parameters, the Design Parameters for this trail may need to be adjusted to accommodate bicycles.(USDA Forest Service 2016, 9.)

3 TRAIL SIGNAGES IN OUTDOOR RECREATION

3.1 Trail Signage Overview

The American Heritage Dictionary of the English Language (2017) defines a sign in its noun form as,

> Something that suggests the presence or existence of a fact, condition, or quality. An act or gesture used to convey an idea, a desire, information, or a command. A displayed structure bearing lettering or symbols, used to identify or advertise. A posted notice bearing a designation, direction, or command.

Since early times, people have been marking symbols to guide trail users. Drew et al. (2002, 4) and National Park Service (2017, 57) both state that trail signage not only guide trail users to the right destination, but also offer an educational experience on the area by explaining and interpreting interesting natural and cultural features. They educate trail users on the proper use of the outdoors and raise awareness of the area's ecosystem and biodiversity conservation issues. They also list regulations and guidelines and serve to control unwanted or illegal activities and management activities along the trail. They warn hikers of dangers and unusual trail conditions, therefor likely decrease the potential risks might happen to trail users.

According to Carter (2007, 8, according to Drew et al. 2002, 4–5), in the process of developing trail signage system, there are a number of fundamental conceptual issues that need to be addressed before proceeding. Drew et al. (2002, 4–5) listed out a number of sample questions that trail committee should tackle in advance of trail building process: Why it is need to provide a trail with signage; who the target audience is; what the main activity or theme will be; what will be interpret along the trail; what unforeseen and unobvious risks need to be identified; how the trail signage will be produced; how the trail signage will be placed; who will own, manage and maintain the trail and trail signs.

In regards to sign management, the WTO survey result points out that the authorities and other bodies which are competent for the designation, marking,

development and maintenance of trails vary greatly from one country or territory to another. They can include the National Tourism Administration or Ministry responsible for tourism and often another government department such as the Ministry of Transport or Public Works, a national association such as a forest administration if the trails lie on national forest property or provincial or local authorities such as prefectures, town councils and other respective bodies. In some countries, the owners of land may be held responsible for signposting and marking. A common trail signage standard is required for tourist routes whether at national or international levels, applied on trails which cross various countries. (World Tourism Organization 2001, 43.)

3.2 International Trail Signs

There are nearly 7,000 languages being spoken around the world. Therefore, it makes it impossible for an individual to understand and speak all the languages. Dating back to prehistoric time, human has already developed universal language; it can be seen in the form of signs and symbols. Ideas and concepts are reflected in the form of ideograms or hieroglyphs. (PECB, 2014.)

Gradually, all of these symbols, signs, patterns, and motifs led to the development of language, forming the richness of contemporary human life, especially in the way one communicates and express one's idea, opinion and expectation. (PECB, 2014) Sharing the same view in regards of the influence of globalization on human communication, the World Tourism Organization (2001, i) points out that even when nowadays the globalization phenomenon leads to ever-more frequent encounters among people from many parts of the world, the difference in cultural systems, with speech and customs is still present as a struggle that a universal language could hardly reconcile.

In a multifarious world under the development and expansion of the information society and new communication technologies, common languages in images must be devised to facilitate the movement of persons and improve the safety, security and comfort of the users of tourism facilities and sites. Tourist routes and trails related to outdoor recreational activities such as climbing, walking, hiking, trekking, cycling, canoeing, skiing have become a major tourist attraction

and, as a matter of necessity, require proper use of logos, signposting and markings. They are needed for a number of reasons such as for general information on existing routes and trails; to provide, promote and strengthen their visibility and image; to facilitate user flows; to provide for users' safety and comfort, to protect the natural environment and, in case of their commercial exploitation, where appropriate, to equip their operators with a handy means to facilitate advertising and marketing. (World Tourism organization 2001, 43.)

In case written words are inadequate, incomprehensible, the use of symbol comes in and plays an important role in facilitating the communication. Images, words, objects and ideas represented by symbols can be widely understood if they are simple and meet universal needs. (World Tourism Organization 2011, i.) There are many symbols that are well known and easily understood, for example: the no dogs/pets trail sign (Figure 11). However, there are some symbols that remain unclear and are hardly recognized by the general public leading to misunderstanding such as the picnic signs below which can be misunderstood as the letter A by many people (Figure 11). This happens partly because these symbols are rarely used; in addition, there are different variants of symbols which are used to convey the same message.

Figure 11 No-Pet Sign & Picnic Site Sign

In a study focusing on the comprehension and training of international road signs focused primarily on traffic signs, Ward et al (2014, 1) conclude that comprehension is one of the most important measures of sign adequacy. With the increase of travelers using trails/roads in foreign countries, the topic of cross-cultural signs has caught attention of trail/road management associates.

Road signs should be internationally understood and they should convey the same meaning no matter in which country the context it is (Raasakka 2015).

To challenge this point, Shiner et al. (2003) claimed that persons from different countries comprehend international signs at widely different levels and signs cannot be displayed in thousands of languages to suit the trail user's need. The solution suggested to solve this issue is to standardize signs as much as possible and adhere to the following ergonomic design principles: spatial compatibility (direction of road sign maps with the direction given by the sign components), representation that has physical similarities to actual objects, and familiarity-simple symbols to avoid sign miscomprehension.

3.3 Warning Signs

Warning is a mean of safety control and communications used to warn people about potential hazards during many contexts, such as: during product use, when carrying out certain tasks, and in the environment. Warnings have four main purposes: to communicate important safety information, to influence people's behavior to improve safety, to promote compliance to avoid potential hazards and to remind people about the hazards. Hazard controls have been playing an important part as manufacturers are responsible for providing safe products and environment for end-users. (Rousseau & Wogalter 2006, 147–148.)

Apparently, warning signs are one of many kinds of signs that are implemented on outdoor recreation property to assure trail user's safety. Looking at the core issue of safety management, researchers raised a concern over signs that warn of potentially unsafe situation is the weakest, final solution of hazard controls. Warnings are one of several potential solutions, yet not the most reliable, effective one when comparing to other work that could be implemented to protect people and property, such as: engineering and other technical work. Safety improvement in outdoor recreation can be achieved by using a classical hazard-control hierarchy (Figure 12).

Figure 12 Harards Control Approach (Rousseau & Wogalter 2006, 147)

The approach consist of a sequence of step as follow: (1) hazards should be eliminated by design, such as: build trails/road away from the wildlife conservation area; (2) if hazards cannot be eliminated, then they should be guarded against through physical barriers or procedures- placing barriers around the trails/road to stop wild animals from accessing them; (3) if hazards cannot be designed out or guarded against, then the persons at risk should be warned about the hazards and be informed of the precautionary measures that they should take-put signs that warn trail users about potential rock falling, wild animals, etc. (Rousseau & Wogalter 2006, 147–148.)

In outdoor recreation context, hazards can be in many forms and not guarded against. Wogalter (1994) suggested that it is more important to avoid the hazard than to be aware of it but still be involved in the accident. Training can also be included in the hierarchy as it performs as a presentation of hazards communication. Safety training is an important form of safety communication for trail staffs, while trail warning signs act as a mean to communicate safety rules and regulations to trail users. Another option to improve safety is direct behavioral testing, yet this might be problematic due to infrequency of critical events, ethical concerns allowing hazardous situations to occur and difficulty to create authentic, credible risk situations.

Rousseau and Wogalter's findings show that the first and foremost requirement of warning signs is to get noticed. If people fail to notice the signs, there is no use in its utility because it will consequently lead to failure in further follow noticing. Therefore, improving sign's conspicuity is important; it might include enlarging the sign's size, using eye-catching colors and symbols, and choosing prime location to put signs (Rousseau & Wogalter 2006, 147–148.) The infographic below is an example of signs implementation in outdoor context (Fiugure 13).

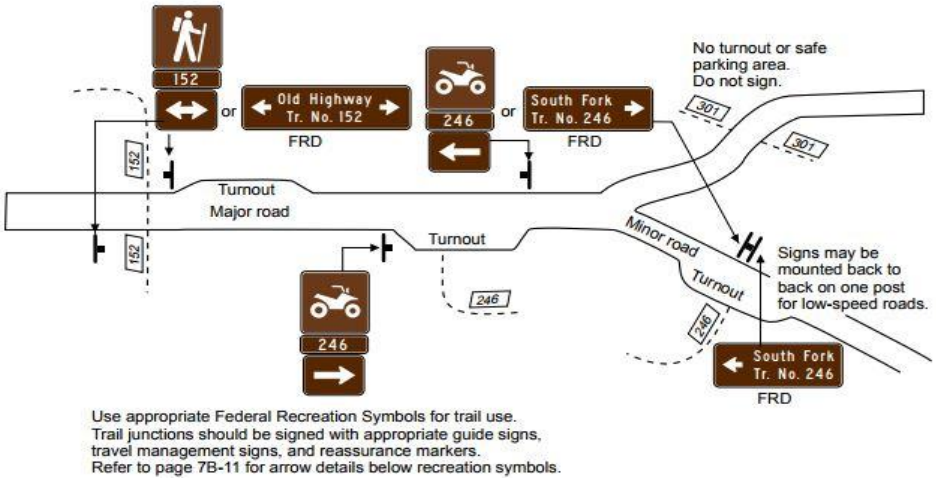

Figure 13 Placement of Road Guide Signs for Trail Crossing (USDA United States Department of Agriculture 2013, 316)

Another research done by Smith-Jackson and Durak (2000) shed deeper insights into the sign's noticeability failure. In practice, Wogalter et al. (1991, 72–75) carried out a research on hazard perception and its relation to willingness to read warnings. They came to a conclusion that people would be more willing to read signs, if they perceived the products or environment to be more hazardous. When people do not perceive the potential hazards, they do not look for warning or notice. Therefore, besides enhancing warning signs' conspicuity increases the likelihood that a warning sign gets noticed. According Wogalter & Laughery (1996, 4) came to the conclusion that warning design characteristics such as color, shape, and the presence of a signal word, pictorials and icons can enhance conspicuity, increase perceived hazard levels and facilitate comprehension, and motivate compliance.

According to Bell (2007, 48), there are two main possibilities to convey the message: leaflets or signboards. Leaflets are an important alternative or supplement to fixed signs. They can be reprinted annually with up-to-date information. As they are carried around by the visitors, they can be easily referred to at any time. Nowadays, together with the development of new technology devices, trail signs data bank is widely available via internet. There are many helpful websites to help trail users in the process of planning and interactive map gps coordinates while ones are actually on-site.

4 RESEARCH ON TRAIL SYSTEM AND TRAIL SIGNS IN DOOR RECREATION

4.1 Thesis Research and Research Methodology

4.1.1 Thesis Process

As mentioned in the introduction, my interested in doing a research on safety in tourism industry developed at the beginning of the second year of study. I had a discussion with Mr. Pekkala and Ms. Raasakka, whose work focused on safety aspect in tourism industry. The commissioners expect to have a comprehensive understanding on the impact of trail signs in ensuring the safety of outdoor recreation's participants from different cultures. They also seek for the possibility to apply good practices abroad to outdoor recreation trail Lapland region.

The whole thesis writing process includes of administrative work, information retrieval, research and writing took more than a year to complete. The information retrieval process took longer than stated in the plan because of the lack of theory, literature and books on the topic. Data and information is fragmented and there is a lack of proper research that has been done, either in Finland or in the USA. Utah is a well-known tourism destination which provides platform for various types of outdoor recreation activities. Trail system in Utah is well-managed under strict system. Trail supervisors in the region have projects running all year round to maintain trails, as well as to attract more people to come to the destination.

One of the biggest obstacles I met throughout the writing process was to find appropriate interviewees. Spring time is busy time for trail management associates, they are usually out on the field to do trail renovation work or work on the annual report. Therefore, it was difficult to set up an appointment with them. My coworker who is the information specialist at Utah Valley Convention & Visitor Bureau has helped me a lot in finding contacts of potential respondents. The interviews went smoothly as the respondents were

informative and very helpful. The thesis process is summarized as seen in Table 2.

Table 2 Thesis Process

Period of Time	Goals	Research Methods
February 2016	Idea paper, thesis plan submitted, signing contract with the commissioner	
March 2016	Information gather, preparing training paper at the same time, studying relevant literature	Content analysis of the sources
April 2016	Writing the theoretical part, finding contacts to interview	
May-September 2016	Conducting research	Content analysis, structured interviews, unstructured interviews
January-April 2017	Writing the theoretical part	
April-July 2017	Writing the research part	

4.1.2 Qualitative Research Methodology

The aim of this thesis is to study the importance of having a common trail and trail signage standard and the possibility to integrate them to the Lapland region. By its nature, qualitative research is non-standard, dependent on the subjective experience of both the researcher and the researched (while comparing to quantitative research) (Greenhalg & Taylor 1997). In qualitative research, empirical material can be collected in three main ways: interactive interviews, where researchers collect data by asking respondents to verbally describe their experience; written description, which respondents are asked to write down their experiences and the researcher's own observation of either verbal or non-verbal behavior (University of Maine 2010, 5).

There are several different forms of qualitative interview. However, as no research interview lacks structure most of the qualitative research interviews are semi-structured, lightly structured or in-depth (London 1994, 89). A structured interview is similar to a job interview which the questions, either in close-ended questions or open-ended questions, are asked in a set. This

interview method is easy to replicate and the data can be checked constantly, so the reliability is increased. However, structured interview is not flexible due to the prepared questions, the interview schedule must be followed and therefore, new questions cannot be added in during the interview, even if researchers want to ask for more details from respondents. (McLeod 2014.)

According to McLeod (2014), unstructured interviews, comparing to structured interviews are less formal and can be considered more as guided conversation. This interview method does not have strict interview schedule. Therefore, questions can be asked in any order and new questions can be added in easily as the interview progresses. Through open-ended questions, interviewees have the opportunity to dig deeper into the issues by asking the respondents for information and clarification. Nevertheless, because of not following any interview schedule, it can be time consuming to conduct the interview and analyze the data. In order to conduct this kind of interview, interviewees must possess certain skills, such as the ability to establish rapport and critical thinking skills to dig deeper into the issue.

The most common is the semi-structured interview. Semi-structured interviews vary widely in length, from a few minutes to many hours, and take place on one occasion or across many occasions. Most qualitative interviews are one to two hours in length. (Wiley 2017, 7.) Semi-structured interview was used effectively in this study. It is considered as one of the most common qualitative methods because of its efficiency in resolving research problems.

The respondents are chosen based on their professional expertise and their personal experience. Hearing from both sides- trails and trail signs providers and users increase the level of credibility. There were seven respondents in total; two were experts working as local trail manager, one was a state park manager, one worked as an information specialist at the county’s tourism office and three were youths taking part in outdoor recreational activities regularly; however, one of the youths decided to not continue the interview later. The interviews with the trail managers were semi-structured interviews, the rest of the interviews were unstructured interviews. There were also random

conversations taking place in various contexts such as the tourism office that I interned at and other local events.

Unlike the quantitative method, semi-structured interview method uses open-ended question, this allows researchers to analyze deeper and have rich transcript/interview interpretations (McLeod 2014). Nevertheless, the interpretations of the research findings can be biased and cannot be generalized, because the respondents' answers are partly based on their personal perceptions and subjective opinions. This struggle was solved by participation validation- asking the respondents to reread carefully the interview transcripts. The method can help to refine theme and theory development. However, it should be carried out in timely manner after the interview is conducted, to avoid changes in respondents' perceptions and views (Burnard et al. 2008, 431).

The interviews provided insights into the current implementation of trails and trail signs and identify the actual needs of having a common trail and trail sign standard. During summer 2016, while doing my internship at the Utah Valley Convention Center & Visitor Bureau, I took the advantage and attended many local events. During that time, my intern place was launching a marketing project. One of the tasks required front desk agents to visit local ranger stations. The purposes of the visitations were to get our staffs to be more aware of current condition of the destinations, e.g. national park/national forest/state park and possible outdoor recreation activities the destinations offered to suggest to travelers. Therefore, I had the chance to exchange contact information with different trail associates and explained the research that I was working on. After having the contact information, I sent them an email to set up an appointment for the interviews.

Eight interviews were conducted, all conducted in English. Four of them were semi-structured interviews. All of the interviews were conducted face-to-face. Three of the respondents were local trail managers managing trails, wilderness, and outdoor recreation areas on different federal owned properties throughout the Utah County. All of the interviews were conducted in Utah and recorded by my personal gadget and later transcribed using Microsoft Word 2010. The

interviewees P1, P2, P3, and P4 were at their offices during the interviews, while P5 and P6 were in their homes. The interviews offered helpful information on the topic as all of the interviewees have had long history working on several trail construction and trail maintenance projects.

The interview questions (see Appendix 4) were made at the same time of the theory part writing process to make sure that the answers to the questions received later could tackle the unsolved problem. There were two versions of the interview created based on the main structure. Interview questions for trail managers were focused more on the technical issues and implementation of trail and trail signs, while questions for outdoor recreational activities enthusiasts were focused more on respondents' experience. The estimated length of each interview was 30–40 minutes. All of the interviews were conducted according to the interview plan and the interviewees are listed in table 3.

Table 3 Interview Participant List

	Interviewees	Position	Job Description
Structured Interviews	S.B – P1	Forest Service's Local Trail Supervisor	Trail & Wilderness Management
	J.S – P2	Local Trail Committee	Public Trail Management
	J.A – P3	State Park's Ranger	Park Maintenance & Operation Management
Unstructured Interviews	W.B – P4	Information Specialist at county's tourism office	Maintain good knowledge on region's trail & other outdoor recreation facilities.
	D. J – P5	Hiker	Hike, do track and field weekly. Got stuck in Provo Canyon once.
	H.R – P6	Law Student	Hike regularly with friends and family. Have good knowledge on federal law.

4.2 Building a Comprehensive Trail System

4.2.1 Trail Experience

The choice of route, the way the landscape is experienced, plays an important role in trail designing. Trail designers should use the variety in terrain as an advantage to create a memorable trail path. The interview confirmed some importance guidelines that should be taken into account while developing a trail plan.

> […] People participating in outdoor recreational activities because of the experiences provided by trails. Nevertheless, some trail designers and builders fail to create a trail offering users exciting experience. The reason could either be unprofessional in planning or lack of budget. Most outdoor recreation areas have varying terrain, different natural habitat and a variety of places within them. Some destinations have peaks to climb, others water and snow of various sorts, etc. Before planning to build a trail, it is a good idea to study aerial photographs and maps and carry out an extensive survey of all the features of interest that might be included on the route. (P1)

The trail developing process starts by analyzing many essential questions, such as why a trail should be constructed in a certain place; what kind of trail it would be; what purpose it would serve; what kinds of activities would take place on it (Managed Use); who are going to use it; and whether they have any special needs. (Jenkins and Pigram 2003, 509). One of the main elements deciding trail designs are the needs and interests of intended users. Their needs will vary with age, physical ability, and interests. These elements affect trail characteristics, including length, difficulty, slope, and layout. (National Trail Offices 2012, 7; Bardon et al. 2003, 3). For example, trails designed for elderly recreationists should be at either easy or average level. While trails for active youth and adult have a greater degree of difficulty, with steeper slopes and access to high bluffs or cliffs.

P2 summed up that the process of developing and building a good trail takes time and effort of many parties involved. Beneath a good trail appearance is a

painstaking process including work in scouting, design, lay out, construction and maintenance. A trail must be easy to find, easy to travel and convenient to use that anyone who has interest in using the trails for their specific purpose would easily gain access to. Otherwise, if the official trail is not the path of least resistance (in this context: a physical pathway that has tendency to least energy state), users will create their own trails. (USDA 2007, 10.) The Trail Training partnership developed a guide to summarize the process of building a trail. The Mountainland Associations of Government developed a table summarizing trail building process (see Appendix 2). (P2)

Aerial photographs–the popular photography methods of taking photos of the ground from air, using light aircraft, flycam or helicopter is used to study the landscape. Also, maps and extensive surveys of all the features of interest that might be included on the route should also be conducted. According to Bell (2005, 96–98), the survey should record various kinds of viewpoints, e.g. peaks, narrow valleys, waterfalls, ponds and lakes, cliffs and rock features, stands of special trees, areas of meadow, archaeological or heritage sites, shorelines, caves, dense vegetation, and bogs. Bell pointed out that a key aspect of trail design is the choice of the route, not only the length and gradient but also in the way the landscape is experienced. One of the essential elements that keep people from coming to the trail is the exciting experience that the trail could offer.

There are many aspects of a trail that trail users take into account before hitting a trail. Besides memorable experience, another important element that trail should be able to offer visitors are safety and comfort. Obtained these core elements, visitors will be returning to the area. A comprehensive system of wayfinding is the key to creating that comfort level. Using landmarks and signages could make a great impact in reassuring trail users' safety while taking part in, within the ultimate purpose of having a safe, memorable trail experience.

The process of wayfinding mainly consists of Orientation, Route Decision, Route Monitoring and Destination Recognition. Orientation is the general navigating process to determine one's curent location in relative to nearby objects and the final destination. Route Decision is the process of making decision to choose a route to get to the destion. Route Monitoring is monitoring chosen route to confirm that it is leading to the destination. (Lidwell et al. 2010, 260.) Each touchpoint can be strengthened by a comprehensive system of signage. Figure 14 is an example of the journey map in Town of Mamoth Lake, depicting potential touch point for visitors.

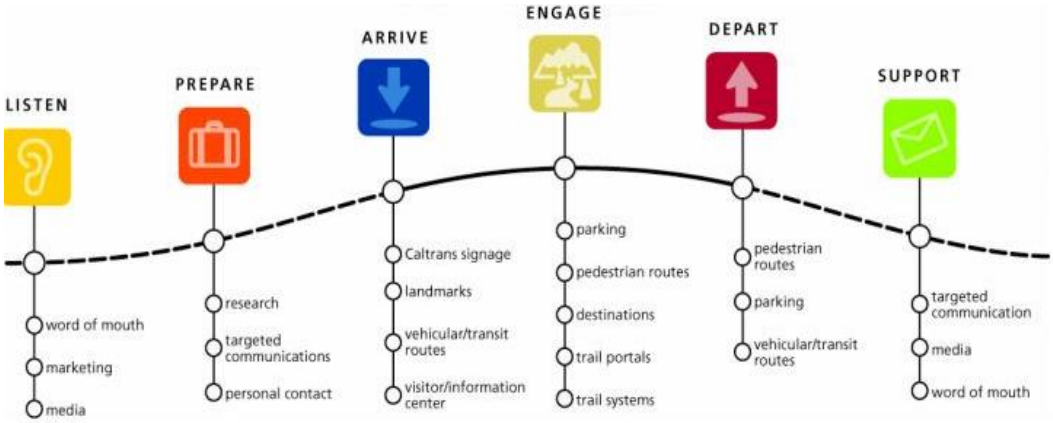

Figure 14 Outdoor Recreation Journey Map (Town of Mamoth Lake 2017, 168)

4.2.2 Trail and Trail Sign Data Bank

In regards to the possibility to get rid of trail signs and substitute with online data bank, P6, who major in Law, firmly stated that on-site signs are very important; even information about trail and trail signs can be found easily on the internet websites nowadays; on-site trail signs are just unreplaceable, especially warning signs. They warn and help trail users to become aware of potential hazards that might happen, so that trail users could better avoid or take action upon. From the perspective of trail planners, they could save themselves from being sued to the court. (P6)

P5 recalled an experience while hiking on a public trail in Provo Canyon, he got lost because there were lack of proper signs implemented along the trail.

> […] We left from the Bridal Veil Falls area followed along the Bonneville Shoreline Trail until we found ourselves surrounded with steep rocks. We did not know whether the trail was officially open for recreationists or not. We just followed the path and at some point noticed that there is not any sign along the trail. We were stuck there, trying to get back but it was pitch dark so we had to call the rescue team to come. Warning signs, trail signs, especially illuminated ones that glow in the dark would be helpful, because hikers sometimes forget changing condition. (P5)

It is clear that trail signage plays an important part in guiding trail users to the right destination and avoids potential risks. Trail users have the right to access trail information when planning their trips according to their interests, timeframe and abilities (National Park Services 2016). Trail information can be found in a variety of sources, for example: maps, brochures, information kiosks, and guidebooks. According to Bell (2007, 48), when trail users arrive at the trail, there are two main possibilities to convey trail sign message: leaflets or signboards. Leaflets can act as supplement to fixed signs as they can be reprinted annually with up-to-date information. As they are carried around by the visitors, they can be easily referred to at any time.

Nowadays, along with the development of new technology devices, trail signs data bank Trail map, trail head information, driving instructions, special regulations and guidelines are available for trail users via internet. One of the most popular trail websites used in the USA includes AllTrails, American Trails. P4 stated that these websites are a great information source as they are also a community built platform that users add personal trail experience, write reviews and update special conditions and regulations. Therefore, trail users have a better understanding of the current trail situation before actually hitting the trail.

However, trail signs cannot be replaced despite the development of virtual technology. Those include recreation signs, cultural interests signs, and rescue signs. which guide road users to a general area and then to specific facilities or activities within the area are also found on the trails (California MUTCD 2014, 1). Risk management concerns are a big factor in providing more signs for what could be argued are trivial changes in trail surface, grade, or curvature.

However, people are used to constant warnings on roadways; so many trail managers adopt highway standards for providing signs.

4.2.3 Common Trail Standard

In Chapter 2, the Federal Trail Data Standard has been introduced. P1, P2 and P3 all agreed that having a common trail standard would be beneficial. Trail information can be used for many purposes including planning and management, mapping and condition assessment, routing and navigation, public information, costing, budgeting, information retrieval, emergency response, and research for most internal and external needs.

Moreover, the Federal Geographic Data Committee (2011, 1) stated that trail data standards enable national, regional, state, and trail-level managers and the public to use mutually understood terminology for recording, retrieving and applying spatial and tabular information. (Federal Geographic Data Committee 2011, 1). This suggests that having a common trail standard will not only benefit trail managers, but also trail users. In regards to the topic of a common trail standard, interviewees expressed their concerns and gave explanation of the struggles hindering a common trail system.

P3 stated that building a common trail standard poses many challenges on trail management associates. In the USA, trail management system is highly constructive, based on land management system. The Bureau of Land Management owned more public lands than any other Federal Agency including many wilderness areas, national monuments and other protected areas that fall under the category of National Landscape Conservation System. The Forest Service that managed national forests and many grassland areas, while the National Park Service manages all national parks and some of the national monuments. So every agency has its own land and trails to manage. The most difficult challenge is to get all the trail supervisors to apply the same trail standards on their managed properties, not mentioning private land owners.

From the findings, trails are managed by different associates and affiliates, making it difficult to have a common trail standard that can be applied on all

trails. Developing a common trail standard that reflects all different trail attributes and can be used regionally or nationally is a goal that either many federal agencies or trail management associates have been working on. The main reason behind developing a common trail data standard and trail information source is that the system will make it easier for the information to be accessed, exchanged and used by more than one individual, agency or group.

Despite the divergence in trail management, a common trail could be applied regionally, nationally if associates reach the consensus on a common trail standard. In reality, the National Park Service, the Bureau of Land Management, the United States Fish and Wildlife Service, and the United States Forest Service have worked for many years with each other and with States, local governments and trail organizations to promote and develop trails for the benefit of the public called Federal Trail Data Standard (FTDS). The standard is applicable to all trails managed by trail standards co-founders, of which National Scenic Trails and National Historic Trails are part of. (Federal Trail Standard 2011, 2.) Nevertheless, according to my observation, outside of the federal governed properties- local destination management associates have been developing their own trail categorization system depends on the destination's landscape structure, demographic and user's intended uses, leading to a trail signing system that are lack of consistency.

4.3 Creating User-friendly Trail Signs

4.3.1 Sign Designs and Mounting

As discussed in Chapter 3, signs' main purpose is to guide trail users. Therefore, mounting plays an important role in order to get the signs noticed. P2 stated that signs should be located at perceptible places, yet at the same time, their attention does not create a hazard or obscure a hazard. These places include trail-heads, significant features or intersections and are relevant to the purpose or focus of the trail. Surrounding vegetation or environmental effects such as sun glare should not have an impact on the visibility, legibility and durability (fading of the text) of the sign information. For example in polar climate with low temperature and excessive snowfall, or tropical climate with

extreme heat, signposting work takes more mounting and cleaning work later on to keep signs visibly clear (USDA Forest Service 1998, 3). Before implementing trail signs, it is important to calculate, map out the specific plan of signs positions and placement, and carry out interpretive planning to test the trail signage system.

From the findings, it came clear that in order to mount signs properly, trail workers must comprehend how reflective signs work. Retroreflective signs should always be put at eye level and perpendicular to the trail. If for example snowmobile trail signs are placed higher or lower than driver's eye level, they do not reflect headlight beams to the riders. Moreover, signs must be put at a calculated distance so that they provide trail users an efficient amount of time to react to a hazard or unexpected condition.

P3 mentioned elements that should be taken into account such as: budget, aesthetics, durability, maintenance costs, and replacement cost due to vandalism or theft. According to him, different destinations may decide on different materials. Nevertheless, wood has been widely used because of its natural, aesthetically pleasing appearance and available. The wood must have high adaptability and resistance to weather because, as a matter of fact, wood used outdoors has the tendency to be affected- moved or distorted, got shrunk, warped due to the area's temperatures, moisture conditions, surrounding environment and weather conditions.

On the topic of choosing material to produce trail signs, P1, who has experienced working on trail sign mounting and maintaining for years said

> […] Choosing sign material is an important decision that trail committee has to agree upon. It does not only improve quality and conspicuity of the sign, but also decides the amount of maintenance work later. It takes careful calculation work to choose the kind of material that can yield high quality signs, yet also affordable. The National Parks have been using wood signs. Wood is an easy to find and inexpensive material to make into signs. Nevertheless, in the long haul, wood is not the best option as once it got damaged by insects or damp, it must be renewed totally with new

> one which might be expensive. In fact, our goal is to renew all of the wooden signs with metal ones on Forest Service's property by 2018.

When asked whether there is any important guidelines in developing trail signs in region with harsh weather condition, P3 suggested that shorter posts would guarantee less leverage of snow creep tipping the posts and material used should not be wood, as it will be hard to wipe out the snow. In extreme weather condition, wood may not be the most environmentally sustainable material to use pertaining to the entire life cycle of the sign, including all required materials and energy, as well as disposal of materials. HDPE plastic signs have proved to last longest, for decades, while comparing to other signs which made of other materials such as MDO plywood, western red cedar or oak.

4.3.2 Sign Standard

All the trail supervisors agreed that most of trail signs vary among properties and that signposting should be part of tourism policies on information, promotion and regional development. Many properties were used to create their own sign marking systems to embark their uniqueness. P4, P5 also recognized that there were many versions of trail signs on trails they were on, except some certain trails managed by the National Park Services (NPS). The search for consistency must therefore be one of the main obligations of those responsible for tourism signs and symbols.

> […] One of the biggest challenges is to have trail committees regionally and further, nationally to use the same signing system. Recently, destinations have been putting an emphasis on unique experience that they can offer. Therefore, every destination and territory is looking for its own identity and uniqueness by creating a new type of signs, giving rise to disruption of logos, notice boards, posters, trademarks and signposts with a clutter of national and regional messages and incoherence. (P3)

In the Trail Signing report, National Park Services added that additional locations and conditions for which signing may be needed include the following: trail termini, junctions with other trails and roads, administrative boundaries,

special management areas, lakes, streams and other features identified on maps, trail guides, or at the trailhead, and Interpretive opportunities (USDA United States Department of Agriculture 2013, 278). Signs should be placed with consideration of approach speed, space to maneuver without obstruction or blocking the pathway for other users, offer clear visual lines of other trail signs and minimize the potential impact on the views of the landscape (Drew et al. 2002, 4).

P1, who had long history of building new trails and implementing trail signs, stated that the core issue is that trail signs system are developed and implemented accordingly to the trails. Therefore, in order to develop a common trail sign system, a common trail standard system must be developed first, and then divergences in the trail signing system can be avoided. Public agencies and private organizations which manage trails or trail segments are responsible of developing trail signage system for the trails have varying signing methods.

To show her assent on the matter, P2 stated that standardization of the types and locations of signs along the trail is desired as the comprehensive system of trail sign enhances not only the safety of a person, but also the property, such as avoiding trail users to make their own paths, which might lead to nature and wild animal habitat destruction. This matter cannot be done by a destination itself, but requires cooperation of many related associates, such as destination management organization (DMO) or local ranger district to develop tourism development plans that cover road signs to allow domestic and foreign visitors to receive information on the location of sites of attractions and how to reach them.

4.3.3 Comprehending Warning Signs

After having noticed the sign, trail users have to comprehend it, make decisions to avoid the potential hazards warned. Researchers and trail supervisors have been studying the effectiveness of warning signs, concerning whether the symbolic version of a sign is more effective than a text-based one.

> […] Let's take an example: There are two signs, one with only black texts and one with very clear symbol and engaging pictures. Which one would be more likely to get people's attention? Probably, the white background would not get people's attention, not to mention to get them to comprehend it and follow what it suggests. On psychology perspective, our eyes are prone to look at clear, eye-catching objects. I believe that people are more willing to look at signs if they catch their attention, so sign with clear symbols/engaging pictures work great in this case. (P6)

Comparing to text-based signs, a symbol is able to communicate safety message to a wider range of people because they do not rely on words, language to convey its meaning. As discussed earlier in chapter 3 (International Trail Signs), in cases of written words are inadequate, incomprehensible, the use of symbol comes in and plays its important role in facilitating the communication. A harmonious combination of texts and symbols is another key factor to improve the sign's conspicuity.

Murray et al. (1998, according to Wogalter et al. 2002), concluded that symbols are used most effectively to communicate simple concepts, instead of abstract one. In order to communicate abstract concepts thoroughly, interpretive signs are used to fulfill the requirements. Interpretive signs are especially designed to give trail users detailed information on the trail's characteristic, the area's ecosystem, special area's phenomenon and hazards that people might encounter on the trail and how to deal with them. However, interpretive signs are only appropriate to be implemented at either information kiosk/trailhead or places along the trail that do not cause any hazards to trail users.

Comprehension can also be improved by signs formatting. P6 suggested that potential hazards could be listed out as bullet points. The most important job is to make sure that trail users are aware of the list before hitting to the trail. Therefore, this can be put on local trail website, tourism board-outdoor recreation's section, or at the information kiosk/trail. P5 added to the idea that word choice also plays an important role in comprehension as instructions should be concise, clear and guide trail users to perform proper actions suggested.

Signal words have proved to play an important role in getting trail user's attention. P6 shared that words can have strong influence in guiding people's action. In regards to signal words, there are different levels of hazards they represent. Although both of the words represents high level of hazards the word DEADLY is considered as quite a strong word that suggests an extremely hazardous situation comparing to DANGER, while WARNING and CAUTION represents lower level of hazards. P4 stated that sign with DEADLY and DANGER get more of her attention, comparing to other. Also, many of these signs are in yellow color, according to a research on color, yellow is the most luminous of all the colors and also considered as the standard color sign indicating caution. In international agreements, danger warning signs are either triangles or diamonds in shape (AIT–FIA Information Centre 2008, 4).

P5, who was in an emergency situation while hiking, shared an important idea by pointing out the lack of solution offered in state of emergency displayed on most of the signs. She said that warning is not enough, the signs should also suggest what to do, how to ask for help in emergency situation. An idea is to include the visitor information center or emergency telephone number on signs for trail users to contact, in case they find themselves in hazardous situation. This option is not practical in dead zone area, but it can be solved by using mobile personal alarm with GPS trackers, either provided by the destination management organization or at trail users' own expense.

In addition, interests to international trail sign system is in part motivated by the increase number of trail users coming from different countries. One of the most important factors of sign adequacy lie in its understandability, meaning the sign becomes useless if trail users fail to comprehend its meaning. P4 shared that many travelers indicated that they do not always understand written signs, especially when they are used outside of their countries due to different culture background or lack of proper training. Therefore, in order for signs to be useful and fulfill their tasks to promote safety behavior, trail users who do not understand the local language must also be able to understand the signs (Ward et al. 2004, 2104). Figure 15 is examples of different version of sign carrying the same message: one only uses plain black text on yellow background while the other one used symbol and stronger signal word- CAUTION.

Figure 15 Falling Rock Caution Signs (Shutterstock 2017).

> […] I found signs with symbols are more eye-catching and easier to understand than wordy warning notices. It is even better if there is a harmonious balance of text and symbols like the falling rock warning sign I have seen a lot while hiking. On comprehension adequacy perspective, the sign on the right is more international as even people who do not understand English can decode the meaning of the symbol and take proper action to assure their safety while being on trail. (P5)

A traditional training session has proved to improve hiker's sign comprehension ability.

> […] On our visitation to Timpanogos cave, after arriving at the information center, we visited the information center where there were a flat screen playing information video, materials and pictures about the cave displaying all over the place. Then, we gathered with another group of hikers. The ranger introduced the terrain and the area's ecosystem. She warned us about various potential hazards we may encounter and explained the meaning of some signs we would see later on the hike. The session was short but I found it very necessary because we were new to the area, some of us are out of state and even out of the country and are vulnerable to hazards due to many reasons. (P4)

Along with the development of new technology, there are many alternative signing methods that could be utilized in the future, in addition to on-site signs. Many visitor information centers are now equipped with miniatures of terrain area, interpretive signs, flat screens playing safety videos with subtitles in

multiple languages. These methods facilitate the safety training process that can be implemented by any destination management organization. There is a need for more academic researches on making and mounting warning signs that are hazards oriented, affordable yet high-quality with premium features using the advantage of the development of new technology in order to achieve sign’s most important purpose-keep trail users safe while participating in outdoor recreational activities.

5 CONCLUSION

The purpose of this project is to study the necessity of having a common trail standard and sign standard. The content has a special focus on warning sign to suit the demands of the commissioner- Mr. Iivari and Ms. Raasakka. In result, there are concrete evaluations and suggestions of trail supervisors and experienced outdoor recreationists on the matters.

The research has several limitations. Firstly, the number of interviewees is only six and they are all American residing in the state of Utah. This excluded the diversity in outdoor recreation management system that co-exists in other states and also other parts of the world. Secondly, the findings focus on a universal scale, the best possible practices that could be applied anywhere, not on any certain destination. The summarized research findings can be found in Table 4.

Table 4 Research Findings Table

Building a Comprehensive Trail System	
Trail Experience	Trail design plays an important in shaping trail user's experience. Using landmarks and signages to create comfort level for trail users.
Trail & Trail Sign Data Bank	On-site trail signs cannot be replaced, despite the development of online trail data bank.
Common Trail Standard	To have a common trail standard, either regionally or nationally requires lots of effort from many parties.
Creating User-friendly Trail Signs	
Sign Designs and Mounting	Sign designs and mounting locations have strong impact on its noticeability and comprehension level.
Sign Standards	Sign standard includes convergence in sign can only be developed accordingly to trail standard.
Warning Signs Comprehension	Formatting, signal words, color, etc. all have effects on increasing sign's conspicuity. Various of outdoor recreation destinations are working on possibility to apply more technology devices.

The main results stress the fact that building a comprehensive, common trail system takes effort from many parties involved in the process. All the trail supervisors interviewed all expressed willingness to cooperate to have a common trail system ideally. Nevertheless, they showed hesitations in its potential to be applied on trails on a national scale due to divergence in trail management, unfortunately. Pertaining to the possibility to the on-site trails and only have them in virtual form in an online trail data bank, respondents showed hesitation in terms of the trail user's safety while being on trails that do not have proper signing.

Furthermore, signs are varied between properties, regions and countries. This creates needs for an international trail sign system that trail users from different cultural backgrounds can all understand. However, the use of language can be misused in situations that trail users do not understand the language used on signs. Therefore, the use of symbols comes in and plays an important role in facilitating the communication process. Besides, the research also shows that choosing the best suited materials to make signs is an important issue that trail supervisors need to do proper research on. The sign material has an influence on many related aspects, such as the sign's quality and conspicuity which is also pertaining to the trail user's safety and also the amount of sign maintenance work.

Most trail signs in USA and Finland are different from destination to destination. As destinations place, looking for its own identity and uniqueness, place an emphasis on creating unique experience, they create new types of signs. As a consequence, it gives rise to disruption of logos, notice boards, posters, trademarks, signposts and a clutter of national and regional messages and incoherence. All the trail supervisors interviewed agreed that having a comprehensive sign system would be beneficial. The findings also show the link between having a common trail system and having a common trail sign system as trail signs are developed and implemented according to the trails. Destination management organization should be in charge of tourism development plans covering road signs to allow domestic and foreign visitors to receive information on the location of attractions and how to reach them.

It became clear that on-site trail signs are irreplaceable, despite the collection of diverse electronic trail information in an online data bank. Many studies dedicated to alternative signing methods have been made; lots of these methods have been used in this research to measure its efficiency and possibility to apply on a large scale. Trail's Facebook fan page, trail information websites, applications for smartphones, signs with laser cut QR codes etc. have been implemented on certain areas in the Utah state and have received many positive results. Besides, during summer time, there are free guided tours, information sessions, talk shows, meetings on diverse topics organized by local ranger districts that are open for locals and interested people to help the community to better aware of the outdoor recreation areas that they are living within, to better avoid the hazards that one could meet while participating in outdoor recreational activities.

Sign comprehension is one of the most important measures of sign adequacy and a good formatting could result in a higher rate of sign comprehension. A balanced, carefully designed sign of words and symbols has proved to be the most effective way to deliver the message to trail users. Signal words also should be chosen carefully as they represent different levels of danger in the human's mind. Besides, warning signs should be able to warn trail users about potential hazards and also offer possible solutions in case of emergency.

Further research is suggested for doing a specific research on trail signs under Lapland's weather condition. By doing a proper research with technical theories and calculations and making demo versions of signs then carrying out usability test, a study with a deeper focus on the most appropriate type of signage could be analyzed and a sign system could be possibly implemented in Lapland.

The research, which has an empirical approach, was conducted for the benefits of the project creating new trail sign system for the Lapland region. The research also benefits trail supervisors and trail users. It should shed light on the current state of trails and trail signs and examining the possibility to have a comprehensive trail system and trail signage system in Utah and Lapland region.

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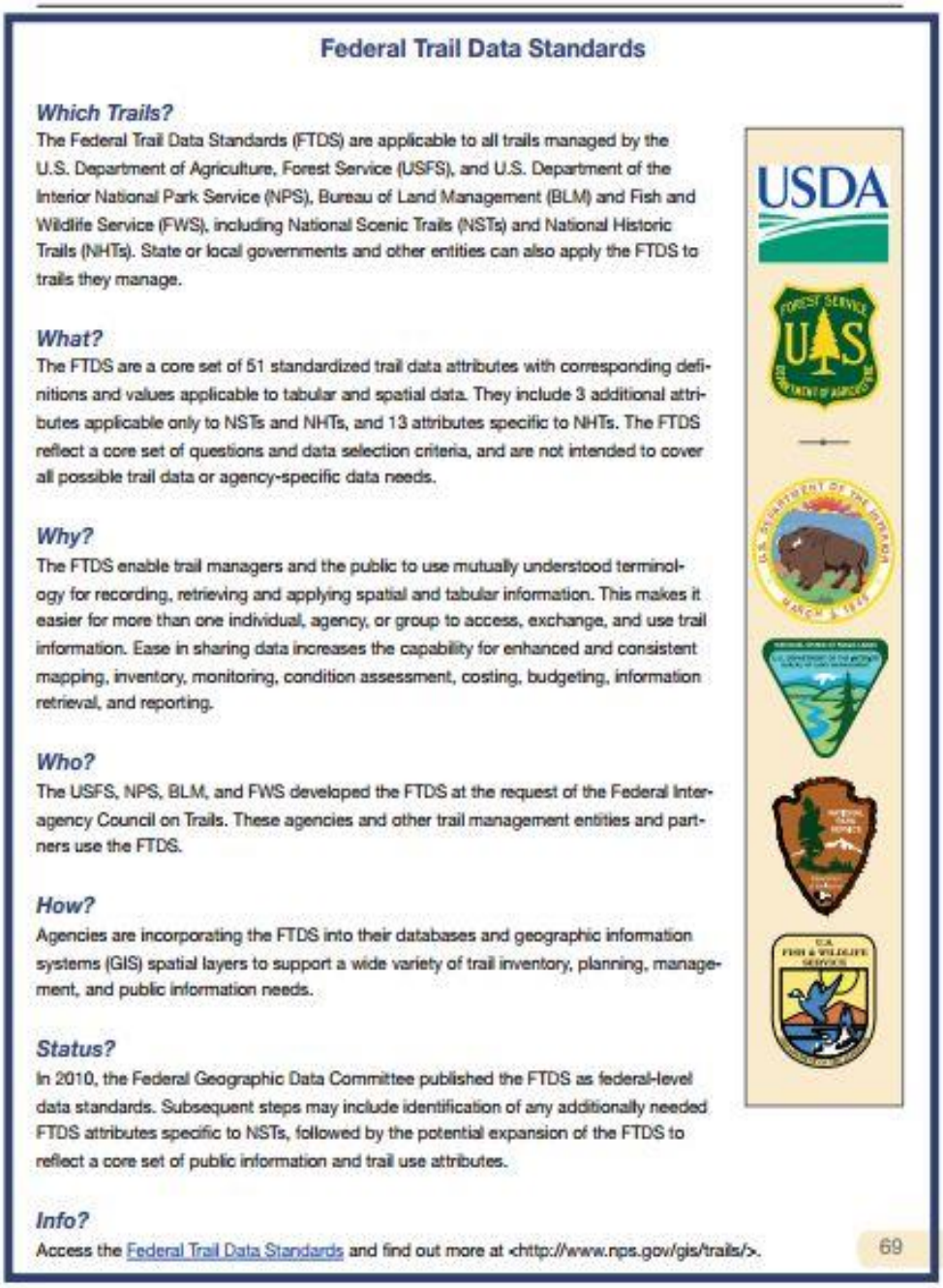
APPENDICES

Appendix 1. Federal Trail Data Standards (USDA Forest Service 2016. Trail Fundamentals and Trail Objectives, 70–71)



Federal Trail Data Standards

Which Trails?

The Federal Trail Data Standards (FTDS) are applicable to all trails managed by the U.S. Department of Agriculture, Forest Service (USFS), and U.S. Department of the Interior National Park Service (NPS), Bureau of Land Management (BLM) and Fish and Wildlife Service (FWS), including National Scenic Trails (NSTs) and National Historic Trails (NHTs). State or local governments and other entities can also apply the FTDS to trails they manage.

What?

The FTDS are a core set of 51 standardized trail data attributes with corresponding definitions and values applicable to tabular and spatial data. They include 3 additional attributes applicable only to NSTs and NHTs, and 13 attributes specific to NHTs. The FTDS reflect a core set of questions and data selection criteria, and are not intended to cover all possible trail data or agency-specific data needs.

Why?

The FTDS enable trail managers and the public to use mutually understood terminology for recording, retrieving and applying spatial and tabular information. This makes it easier for more than one individual, agency, or group to access, exchange, and use trail information. Ease in sharing data increases the capability for enhanced and consistent mapping, inventory, monitoring, condition assessment, costing, budgeting, information retrieval, and reporting.

Who?

The USFS, NPS, BLM, and FWS developed the FTDS at the request of the Federal Interagency Council on Trails. These agencies and other trail management entities and partners use the FTDS.

How?

Agencies are incorporating the FTDS into their databases and geographic information systems (GIS) spatial layers to support a wide variety of trail inventory, planning, management, and public information needs.

Status?

In 2010, the Federal Geographic Data Committee published the FTDS as federal-level data standards. Subsequent steps may include identification of any additionally needed FTDS attributes specific to NSTs, followed by the potential expansion of the FTDS to reflect a core set of public information and trail use attributes.

Info?

Access the Federal Trail Data Standards and find out more at <http://www.nps.gov/gis/trails/>.

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Federal Trail Data Standards—Data Attributes

Below is a list of FTDS attributes by functional category. For complete attribute definitions, corresponding values, and data parameters, refer to the Federal Trail Data Standards Web site <http://www.nps.gov/gis/trails/>.

Basic Trail Information

- Trail Length
- Trail Name
- Trail Number
- Trail Status
- Trail Surface
- Trail Type
- Interagency Identification Code (if applicable)
- Shared System (if applicable)

Trail Administrative Unit and Location

- Administrative Organization
- Managing Organization
- Congressional District
- County
- Jurisdiction
- Municipality
- State

Trail Management and Use

- Accessibility Status
- Designed Use
- Land Use Plan
- Managed Use
- Motorized Prohibited
- Primary Trail Maintainer
- Prohibited Use
- Road System
- Trail Class
- Trail System

Trail Management Considerations

- Historic Significance
- National Trail Designation
- Rights-of-Way
- Special Management Area

Trail Condition and Cost

- Cost Annual/Cyclic Maintenance
- Cost Annual/Cyclic Operations
- Cost Deferred Maintenance
- Cost Improvement/Construction
- Cost Last Updated
- Trail Condition

NHT and NST Information (applicable only to National Scenic and Historic Trails)

- NHT NST Trail Administrator
- NHT NST Visitor Center Name
- Visitor Facility Type

NHT Heritage Resource Information (applicable only to NHT routes or associated heritage resource sites)

- NHT Auto-Tour Surface
- NHT Certification Status
- NHT Condition Category
- NHT High Potential Segment
- NHT High Potential Site
- NHT Public Use Segment
- NHT Public Use Site
- NHT Site Name
- NHT Site Number
- National Register of Historic Places (NRHP) Criteria
- NRHP Property Category
- Type of Route
- Type of Site

Appendix 2. Trail Planning Process (Utah State University 2017)

Step 1	Have political leaders (mayor, city council), in a public meeting, provide for the formation of a Public Advisory Group (PAG) that is recognized by the city. City Staff and the PAG should then be charged with the responsibilities of identifying and creating a trails plan, and recommending that system for adoption into the City Master Plan by city council action. A public advisory committee will provide invaluable public input into the design and selection process, and provide a "citizens view" to the planning process.
Step 2	Identify political allies that will champion trails planning and help push through adoption and implementation. The mayor or members of the city council, or planning commission are vital allies. Local business leaders or other influential and out spoken people should lead this work.
Step 3	Learn all you can about trails, locally and nationally. Some good starting points are on the Internet
Step 4	Create a Trails Committee Vision Statement. (a model statement is available on page 3 of the Sample City Trail Plan) a. Identify the need for trails in the community: Why trails? b. Identify Goals for the trails system; What we want it to accomplish?
Step 5	Develop criteria for selection and prioritization. Create a trail system that is not just an "amenity" or "community extra feature." (Although it certainly will add to community amenities.) A good trail system becomes a necessary part of the transportation, recreation, and open space elements of the city's Master Plan. A good trails system will be validated on its own merits and serves important functions such as: a. Provides an alternative to automobile travel by improving access for pedestrians and bicycles. By reducing auto trips, trails contribute to reductions in congestion and air pollution. b. Trails connect people and places. Trails should connect major origins with destinations: schools, parks, shopping areas, employment and high-density residential areas. Look for corridors that will likely be of most interest to the most people possible. Such a trail system can be fully integrated into the transportation plan, and gain from local support. Community and political support are of utmost importance in creating trails that not only can be built but also maintained well into the future. c. Trails help preserve open space, and are corridors to public lands that are often isolated by development.
Step 6	Once the trail alignments are determined, get to work finding out who owns the properties along the route. Very often the city will have to negotiate easements across private land, or may have to buy portions of lots outright. This is often the most delicate and difficult part of the trail building process. Be prepared both for landowners eager to help, and others that are strongly opposed. Legal, written agreements from the property owners that allow

	easements, rights of way, or are purchase options, will have to be secured. This is one of the most important preliminary steps in the entire process
Step 7	Get rough estimates of the costs of building each trail. Include property acquisition costs and basic engineering and construction estimates. Again the City Planner and engineer will be most useful here.
Step 8	Prioritize the trail routes. Decide which seem most vital and serve the greater community the best according to your criteria. Determine which routes are "ready to go" and reasonable in terms of cost and resources required, and community goals.
Step 9	Create a written plan outlining all of the above process &endash; community needs and how trails will fulfill those needs, selection criteria, routes, and rough cost estimates.
Step 10	Get the trails plan mapped on paper.
Step 11	Complete the written and mapping portions of the trails plan. Have the plan reviewed by the Planning Commission for referral to the City Council for adoption. Work with the Council on incorporating the plan into the City General Plan. The City Planner and staff from Mountainland AOG can assist with this process.
Step 12	Encourage the city to adopt a Trail Subdivision Ordinance, or a strong trails element in ordinances aimed at preserving open space. A trail review ordinance, located in the "subdivision" title of a city's code, can insure the preservation of a proposed trail route. Such an ordinance would require a developer to meet with the planning staff to interpret the trails master plan and its relationship to the proposed development. Trails Ordinances may require, as a function of subdivision approval, that developers provide easements or other appropriate options that will provide necessary lands or funds for the planned trail.
Step 13	Submit the adopted trail plan to the Metropolitan Planning Organization - Mountainland Association of Governments. This is required by some of the State and Federal funding sources.
Step 14	Identify funding sources, and let that guide much of the process of selection.

Signal Word	• According to ANSI (2002)Z535, signal word panel contains a signal word, color, and alert symbol. • DANGER- Indicates immediately hazardous situation that will result in death or serious injury if not avoided. Use white print on a red background (ANSI Z535, 4). • WARNING- Indicates a potentially hazardous situation that may result in death or serious injury if not avoided. Use black print on an orange background (ANSI Z535, 4). • CAUTION- Indicates a potentially hazardous situation that may result in minor or moderate injury. Use black print on a yellow background (ANSI Z535, 4). • NOTICE- Indicates important nonhazard information. Use white print on a blue background. • Although not in ANSI Z535, the term DEADLY connotes higher level hazard than DANGER. • On the left side of the panel is the alert symbol (triangle surrounding an exclamation mark). • Signal word is printed in all upper case. • Position panel on upper-most part of the warning.
Message Panel Format	• Orient message to read from left to right • Start each statement on its own line • Use white space or bullet points to separate statenebts ir set of statements. • Give priority to the most important warning statements (e.g., position at the stop, make larger). • Text should be legible enough to be seen by the intended audience and expected safe viewing distance. • Left-justify text • Used mixed case lettering. Avoid All caps except for specific word emphasis. • Use san serif fonts (Helvetica, etc.) for signal words and larger text in signs • Use serif (Times, etc.) font for smaller text in labels and accompanying materials. • Use plain, familiar, non-fancy font.
Wording	• Give information about the hazard, instructions on how to avoid hazard, and consequences of failing to comply. • Use short, familiar words. • Use as little text as necessary to clearly convey the message. • Use short statement rather than long complicated ones.

	• Use explicit- tell exactly what the hazard is, what the consequences are, what to do or not do. • Use concrete rather than abstract wording. • Use active voice rather than passive voice • Use headline style: Remove unnecessary connected words (e.g., prepositions, articles) in shorter warnings. • Avoid words or statements that might have multiple interpretations. • Avoid abbreviations unless you are sure the target audience knows the meaning. • Use multiple languages when necessary.
Pictorial Symbols	• May be used instead of or as an adjunct to text. • Useful for attracting attention. • May benefit less-skilled readers and readers who do not understand text language. • Some concepts may not be amenable to the production of an understandable symbol. • When used alone, symbols should have at least 85% correct comprehension socres, with no more than 5% critical confusion (opposite or very wrong answers) with a sample of 50 individuals; see ANSI Z535.3. • Minimizing critical confusions is most important criterion. • Symbols not passing a comprehension correct criterion should be accompanied by words. • Development of symbol may require an usability study of multiple design-and-test iterations. • Use bold shapes. Avoid irrelevant graphical details. • Prohibition (circle-slash) symbol should not obscure critical elements of other parts of symbol. • Should be legible under degraded conditions (e.g., distance, small size, abrasion).
Testing	• The criteria in this table are guidelines; some of them conflict (e.g., brevity and explicitness) and some may not be applicable in particular cases. • Hazards, products, and environments differ and so may require unique set of constituents from guidelines. • Usability testing can assist in verifying how well the warning works in applicable situations. Guidance available for symbol comprehension testing in ANSI Z535.3, but there is no formal standard for testing message panel wording.

	• Various methods available to test noticeability, legibility, comprehension, attitudes and beliefs, motivation, and compliance. See chapters in this volume including C-HIP model (Wogalter) and usability testing (Wogalter, Conzola & Vigilante). • User testing can produce input for improvements. • Iterative design and test until a satisfactory warning is produced.
Other	• Position warning where and when needed. • Locate so it will be seen or heard with adequate time to avoid hazard.

Appendix 4. Structured and Unstructured Theme Interview Draft

INTERVIEW STRUCTURE

1 GENERAL INFO

· Interviewees: 3-5 persons

1. People who are in charge of safety issues: national park rangers or university professor

2. Outdoor recreation participants

- American subjects: contacted via face-to-face and emails
- Conducted face-to-face interview: 3 trail supervisors/trail managers, 1 tourism information specialist, 1 profession hiker, 1 law university student
- Semi-structured; general guide approach is combined with open-ended questions.
- Directed at collecting the perceptions of current signs and possible improving options
- Ideas to improve route signs

Estimated length: 30-60 minutes

- Depends on the type of interviews: structured or unstructured

2 THE STRUCTURE

1. Describing briefly the topic of research to the interviewee

2. Asking for the background information (demographic info – age, education level, occupation)

3. Information on reason, frequency and location of taking part in outdoor recreation

4. The person's observation and reflection on route signs on the trails: how the signs were placed (good location or not), the frequency (too little or too much), how understandable they are, how they play the roles in the experience.

5. Their ideas on how to improve route signs in that area

6. "Thank-you speech"