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**THE HISTORY AND EVOLUTION OF NORTH AMERICAN SKI RESORT
MAP STYLE AND DESIGN**

BY

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Bachelor of Arts in Geography, Chico State University, Chico, California, 2013

Thesis

presented in partial fulfillment of the requirements for the degree of

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ABSTRACT

Chairperson: Kevin McManigal

The first official ski resort in North America opened to the public in 1936 in Sun Valley, Idaho. Today, there are over 400 resorts across the continent in constant competition with one another for customers. Ski maps were first introduced as navigational tools, but quickly became a means for advertising what the resorts had to offer. The desire to outshine rival resorts has produced thousands of unique ski maps over the years, forming a collection of maps that has never been comprehensively analyzed until now. The first phase of the thesis involved the gathering of historical and modern ski maps to be examined and catalogued into a database. A total of 1,779 maps were archived along with relevant attribute information concerning the style and design of each map. This database, in addition to interviews with key informants and historical texts, helps to provide a complete picture of North American ski mapping history for the first time. The second phase of the thesis was a quantitative survey of skiers and snowboarders to assess users' impressions and satisfaction levels of modern ski maps. Several examples of ski maps were presented to the survey respondents, and they were asked to provide their opinions and concerns about the overall appearance of the map. It was found that most respondents preferred the traditional painted panoramic style over other styles of printed ski maps, and many were hesitant about the effectiveness of newer mobile ski mapping alternatives. While it appears that printed maps are around to stay for now, the recent retirement of prominent ski map painter James Niehues may signify the demise of traditionally hand-painted ski resort maps. Extensive literature already exists regarding the reproduction of hand-painted panoramas using computer software programs, and as the digital image becomes more accepted in our culture it is possible that many future ski resort maps will be digitally-rendered.

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THE HISTORY AND EVOLUTION OF NORTH AMERICAN SKI MAP STYLE AND DESIGN

1. INTRODUCTION

The history of cartography is intricately entwined with artistic influences, and few types of maps display this relationship as obviously as ski resort maps. Over the past 80 years, hundreds of mountain ski resorts in North America have produced thousands of maps, many of which are incredible works of art. Despite this rich history, very limited academic research exists concerning the style and design of North American ski maps. The goal of this thesis was to undertake a complete analysis of ski map style and design for the first time, accomplished through both quantitative and qualitative analysis. The first part was an examination of North American ski maps in relation to the factors that influenced design elements and techniques over time. This process was implemented by creating an annotated database of historical and modern ski maps, reviewing historical texts, and conducting key-informant interviews. The second part was a survey that assessed skier preferences, understandings, and expectations of ski maps. The results of this study are relevant to the discipline of mountain cartography, in addition to being a valuable contribution for understanding the role of cartography in shaping the ski resort industry.

2. PURPOSE

Little academic research has been conducted on the history and evolution of ski resort maps. Despite the existence of over 500 ski resorts in Canada and the United States and ski maps dating back to the 1930s, no comprehensive analysis currently exists depicting the progression of ski resort map style and design. An article by cartographer Alex Tait (2010) provides a solid platform for understanding the style and design of present-day ski resort maps, but his research does not analyze ski maps in a historical context, describe the development of cartographic

approaches, or investigate influences shaping this unique cartographic genre. In order to contribute to the overall history of cartography, vintage ski maps and historical texts were compiled for analysis, and key-informant interviews were conducted to answer the following research question: *How has the style and design of North American ski resort maps evolved over the years?* The final results will provide a complete picture of North American ski map history for the first time.

The second part of the study assessed customer satisfaction and impressions of modern ski resort maps. A survey was conducted to address the question: *How do skiers perceive present-day ski map styles and features?* The results will help determine what skiers prefer to see on ski resort maps and will provide valuable insight that ski resorts can employ to produce more effective maps for their customers.

The survey also asked skiers questions about their opinions of untraditional and more modern ski map styles and designs to answer the question: *What might the future of ski map style and design look like?* The responses, along with knowledge gained from the other methods, provided for a speculative discussion concerning the future of ski maps.

3. RESEARCH SETTING

Although there are ski resorts on every inhabited continent, this analysis will focus on maps of ski resorts in North America. The majority of North America's ski resorts are located in the United States, with approximately 388 resorts in 37 states. Canada is home to around 128 ski resorts in 11 out of 13 provinces/territories. Mexico has a single ski area that is too small for a map and is omitted in this investigation.

Ski resorts are typically located in mountainous or hilly terrain where winter temperatures are cold enough for snow to accumulate (Figure 1). Many of them, especially the larger ones,



Figure 1: All active ski resorts in North America, 2013/14.

are located adjacent to typical North American “ski towns.” These towns are characterized by fancy restaurants, high-end boutiques, and expensive condos that often exhibit architecture reminiscent of Swiss chalets (Figure 2). The ski towns are designed to be inviting and entertaining, as tourism is usually one of their biggest industries. To encourage people to visit, resorts and their ski towns strive to create a unique “brand” out of their community, and trail maps are one of the best ways to advertise what they have to offer (Fry 2006).



Figure 2: The ski town of Breckenridge, Colorado. Breckenridge Ski Resort can be seen in the background. Accessed from www.breckresorts.com on April 28, 2015.

One of the main reasons North America was chosen as the study area was because of the plentiful data. Many of the resorts revise or completely redesign their map every few seasons, and these maps have accumulated into a rather large dataset to work with. If the study area was instead limited to a single state or province, data would be restricted to just a few resorts and the historical analysis would miss key factors of ski map evolution. Conversely, there are no major regional patterns of ski map style and design across America or Canada, so it makes sense to analyze all ski maps in North America as one single entity.

4. CONCEPTUAL FRAMEWORK

In 2010, the first and most extensive academic research on ski resort maps was published in *Cartographic Perspectives* by Alex Tait. His study examined 428 North American ski resort maps in use during the winter of 2007-2008. For each map he determined the view type, creation method, and artist, setting the baseline for classifying and understanding the style and design of ski maps.

4.1 View Type

A mountain ski map is defined as “a map of the trails and ski facilities of a lift-served ski area,” and is categorized into one of three view types: panorama/oblique, profile, and planimetric (Tait 2010, 6). The word “panorama” is derived from two Greek roots: “pan” meaning “all”, and “horama” meaning “view.” The term was conceived in the late eighteenth century to describe a new type of art form invented by an English artist named Richard Barker. Barker’s invention was a painted circular canvas that would surround the observer to portray a lifelike 360° scene (Oettermann 1997; Figure 3). He exhibited several of his works in London, fascinating the public



Figure 3: Richard Barker’s 1792 panorama of London from the roof of the Albion Mills. Accessed from padavisblog.files.wordpress.com on April 28, 2015.

by instantly immersing them into new surroundings. Within a few years, Barker’s panoramas were displayed in cities across Europe earning him a fortune (Davis 2013).

Since then, the word “panorama” has evolved slightly to have a more general definition. The term today does not specifically refer to a full 360° scene, but more simply “a picture or photograph containing a wide view,” according to the Oxford Dictionary. The adjective form of

the word, “panoramic”, is used in this project to describe ski maps that view the terrain with the user’s perspective at any point that is not at ground level or directly above looking straight down (Figure 4). The word “oblique” may be a more technically correct term to describe this particular view type, but “panoramic” will be used interchangeably with “oblique” in this thesis to be consistent with vocabulary used in Tait’s 2010 article and other literature (Patterson 2000, Jenny et al. 2011).



Figure 4: Mammoth Mountain, California. By James Niehues, 2008. This map displays the panorama/oblique view type. Accessed from www.mammothmountain.com on March 21, 2014.

Panoramas commonly practice somewhat unconventional cartographic techniques, such as vertical exaggeration, rotation, and curvature of the projection plane to accentuate or distract from certain features (Patterson 2000). The result is often a distorted and topographically inaccurate map of the mountain scenery, with inconsistencies in scale throughout the scene. The reasoning for such alterations is to present complex mountainous landscapes in a visually

satisfying and comprehensible manner (Bratkova et al. 2009). If done properly, the imprecise nature of the map will go unnoticed by most map viewers. As a result, the combination of the oblique view angle and subtle modifications to the terrain creates a map that is highly readable and intriguing to non-expert map viewers (Haerberling 2005, Petrovič & Mašera 2006, Schobesberger & Patterson 2008, Dorling & Fairbairn 2013). The oblique view angle of the panorama is especially captivating to many map viewers due to its resemblance to real-world three dimensional views from an airplane or high-ground vantage point (Haerberling 2002, 2005). Patterson explains this captivation, stating that panoramic maps induce the delightful sensation of flying high over the landscape (2000). When it comes to ski maps, this sensation is especially relevant. For some map viewers, examining a panoramic ski resort map may recall the pleasure experienced when skiing down the slope, prompting the urge to return to the ski mountain to recreate the feeling (Tait 2010). These theories are some of the probable explanations for the high propensity of panoramic ski resort maps. Out of 428 North American ski resort maps examined by Tait in 2008, 86% of all resorts employed the panoramic view type. Out of the top 100 resorts, every single map was a panorama (Tait 2010).

Profile maps, the second view type described by Tait, depict the terrain from the ground or a very low oblique angle (Figure 5). They provide basic elevation views of the mountainside and usually appear flat with little depth or 3D



Figure 5: Lost Trail Powder Mountain, Montana/Idaho. Artist unknown, 2013. This map displays the profile view type. Accessed from www.losttrail.com on March 26, 2014.

character. Profile maps are sometimes hard to differentiate from low-angled panoramas, but the primary difference is that profile maps generally lack shading and perspective and only display a single slope-face (Tait 2010). Only 8% of ski resorts examined in 2008 utilized the profile view for their mountain. Although a small percentage, profile maps have their advantages, especially for small resorts. They are generally easier and cheaper to produce than panoramic maps because of the lack of depth and shading. In addition, profile maps are efficient at displaying simple trail layout and connectivity (Tait 2010).

Planimetric maps, the third and final view type described by Tait, are viewed from directly above the landscape in the style of traditional topographic maps (Figure 6). They often display contour lines and are the most topographically correct of the three view types. Because they preserve cardinal direction, planimetric maps are appropriate for navigation purposes and



Figure 6: Willamette Pass, Oregon. Artist unknown, 2006. This map displays the planimetric view type. Accessed from www.skimap.org on March 26, 2014.

showing multiple sides of a mountain in a single image. Despite the apparent practicality of the planimetric view type, they accounted for just 6% of ski maps in North America in 2008 (Tait 2010).

4.2 Creation Method

The creation method of printed ski resort maps is divided into four categories: illustrated, photographed, painted, and computer-rendered (Tait 2010). These methods refer to the creation of the actual terrain of the

mountain, excluding any text or trails later placed on the map. Illustrated maps (Figure 7) are created by hand or computer and are in use at 20% of all resorts and 7% of the top 100 ski resorts in North America. Today they are generally produced with vector-based software programs, but traditionally were hand-drawn using ink (rather than paint). Illustrated maps are defined by sharp lines and polygons and have a less natural and more mechanical feel than painted maps (Tait 2010).



Figure 7: Alpine Meadows, California. Computer-illustrated by Gary Milliken of VistaMap, 2012. Accessed from www.skialpine.com on March 26, 2014.

A very small portion of ski resorts in North America use annotated photographs as their primary resort map; just 6% of all resorts and only 1% of the top 100 resorts (Tait 2010). They consist of photographs taken from the air or ground with overlays of trails and landmarks later added by hand or computer (Figure 8). However, not all academics agree that aerial photographs are actually maps. In 1996, a study was conducted that examined 321 definitions of the word



Figure 8: WhiteWater, British Columbia. Artist unknown, 2013. This map demonstrates the annotated photo creation method. Accessed from www.skiwhitewater.com on March 26, 2014.

“map” dating back to 1649 (Andrews). The most common definition characterized maps as a “representation of all or part of the earth’s surface.” Aerial photographs display part of the earth’s surface, but are not representations. Unless the image has been significantly manipulated, aerial photographs actually capture the surface’s realities. This longstanding interpretation of the word “map” has influenced how we perceive and identify maps today. A follow-up study conducted in 1999 showed 26 map-like images to 286 students at the University of Glasgow (Forrest). The students were asked to determine if the image was a “map”. Two air photos were shown to the group, one at a vertical angle and the other at an oblique angle. Only 7% of the students identified the vertical air photo as a map, and just 3% regarded the oblique air photo as a map¹. Despite the low number of positive responses, some scholars argue for aerial photographs’

¹ It is unclear if the aerial photographs presented to the students were annotated.

inherent advantages as a tool for understanding the landscape (Dale 1971, Drachal 2004). Especially when compared to traditional topographic maps, aerial photographs can be superior for understanding intricate terrain, vegetation type/texture, and color differences (Drachal 2004). Annotated aerial photographs might not be considered maps in the strictest definition of the word, but they are usually sufficient and functional navigational tools. Some small ski resorts utilize annotated photographs because they are practical for displaying compact trail layouts, and are cheap and easy to produce. However, aerial photographs of the resort mountain cannot be easily altered like the other creation methods. Due to the inflexible nature of photographs, aerial images are very limited in terms of terrain manipulation, generalization, or emphasis (Tait 2010). This inflexibility is undesirable to larger resorts with the ability to afford more time consuming creation methods that can modify the terrain to meet their needs.

Painted ski maps can be created by hand or by computer-painting programs (Figure 9). They are by far the most popular creation method of ski resort maps; accounting for 72% of all resorts and 89% of the top 100 resorts (Tait 2010). There are several possible explanations for the popularity of painted ski maps. Firstly, trail maps painted by the most accomplished artists are almost always panoramas, and as stated earlier, panoramas are the most popular view type for ski resort maps. The common terrain manipulation practices of the panoramic view type combined with the inherent freedom of painting grants the artist complete control of terrain, vegetation, and trail representation. This allows the artist to create an image of the mountain exactly as the resort requests, even if it means slight distortion of some features to make the resort appear larger or taller (Tait 2010).



Figure 9: Mt. Alyeska, Alaska. By Murray Hay, 1997. This particular map is an example of a hand-painted ski map. Accessed from skimap.org on April 13, 2015.

Painted maps are also thought to be visually appealing because of the soft brush strokes and colors that pleasantly replicate the natural landscape (Patterson 2000, Bratkova et al. 2009). However, the greatest reason for the high number of painted panoramic ski resort maps is attributed to tradition. Some of the first ski resort maps ever produced were hand-painted panoramas produced by artists with an inclination for cartography (Tait 2010). A few key artists have carried the practice into the present, and today hand-painted panoramas are somewhat of a de facto standard in the ski mapping industry (Patterson 2000).

In recent years, there has been an effort to develop a digital methodology that replicates the traditional hand-painted panoramic map style (Patterson 2000, Patterson 2001, Premoze 2002, Jenny 2004, Patterson 2005, Bratkova et al. 2009, Jenny et al. 2011, Domajnko et al. 2012). The goal of this recent research is to accelerate the process of creating a pleasing

panoramic map through computer-rendering. Computer-rendered maps often use geographic information systems (GIS) and 3D-modeling programs to shape terrain using digital elevation models (DEMs). Some computer-rendered maps use aerial imagery draped over a DEM for a map that resembles views seen in Google Earth (Figure 10). Computer-generated textures and digitally modeled trees are added to the map to simulate the natural patterns of forest and shadow

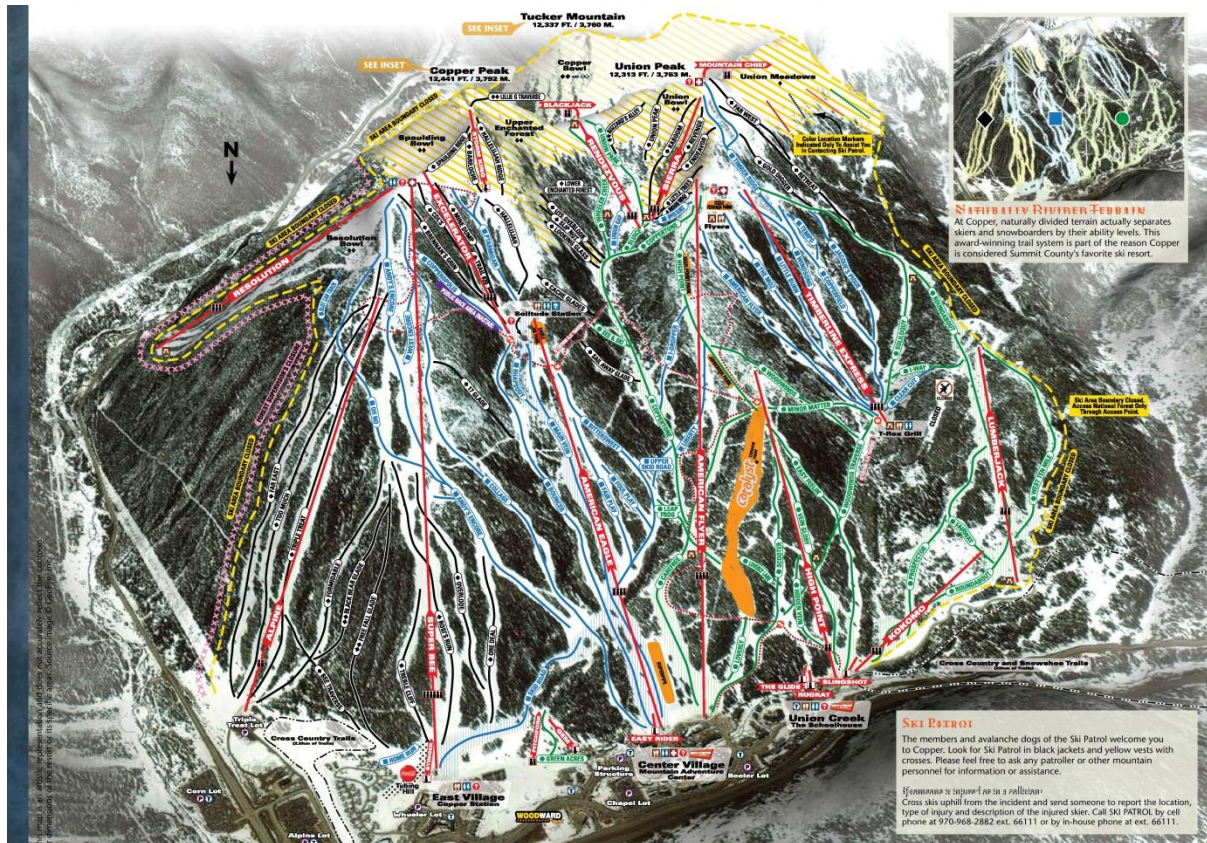


Figure 10: Copper Mountain, Colorado. Artist unknown, 2008. This is an example of a computer-rendered ski map. Accessed from skimap.org on April 28, 2014.

on the mountain. As a result, computer-rendered maps are often not as visually appealing as painted or illustrated maps and tend to have a distinct “computery” feel (Tait 2010). However, it is likely that future advancements in technology will improve the digital process of rendering mountain panoramas. In the meantime, the attempts to digitally automate the process of replicating the hand-painted panorama have not quite been mastered. It is still acknowledged that

professionally painted panoramas are superior to digitally-rendered reproductions (Bratkova et al. 2009). This sentiment is reflected in ski resort maps, as only 3% of all resorts and 3% of the top 100 ski resorts in North America utilize computer-rendered maps (Tait 2010).

4.3 Schematic Ski Maps

In 2010, an innovative new style of ski map was tested at Breckenridge Resort in Colorado by Kenneth Field. Field’s “schematic” ski map was inspired by the famous London Underground Tube Map, created by Harry Beck in 1931 (Figure 11). The map was well-received by its audience, although the schematic style has yet to be actually adopted by any ski resort in North America (Field 2010). James Niehues, a prominent ski map artist, commented in the

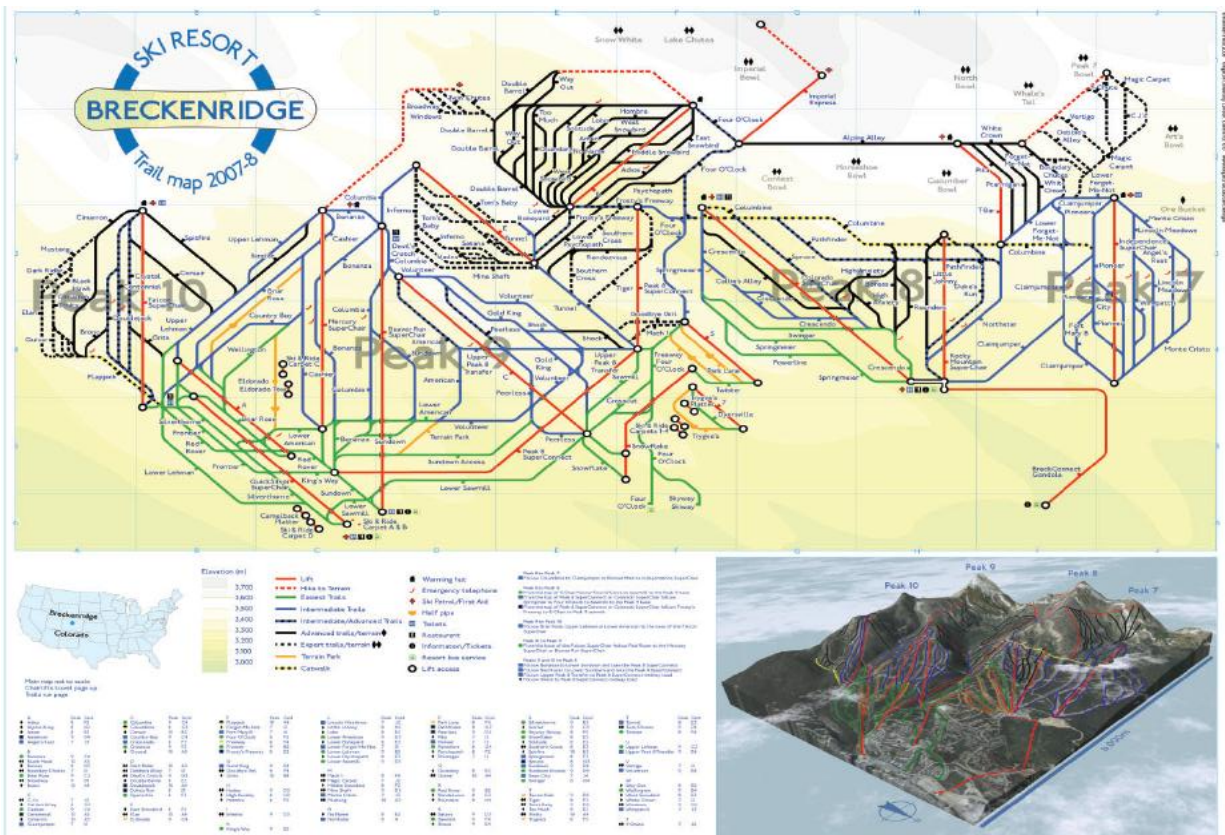


Figure 11: Breckenridge, Colorado. By Kenneth Field, 2007. This map shows the schematic style of ski map tested by Field in 2010. Accessed from skimap.org on April 13, 2015.

article that the schematic ski map provides “an intriguing, accurate and clear way to indicate the routes” but that “most people would think the traditional presentation is still clearer” and that a panorama “gives much more information such as steepness, orientation of slopes and visual reference of trees, rocks and undulation of the slope along the run as well as giving promotional value” (Field 2010, 236).

4.4 Online Ski Maps

The advancements made in computer technology in recent years have had an impact on more than just how ski maps are *created*. Recent advancements have also had an impact on the way in which users *view* the trail map. Traditionally, ski resort visitors are offered a paper map of the mountain resort upon arrival, and may also refer to enlarged versions of the map printed on information boards throughout the resort. But with the invention and widespread adoption of the internet and smartphones, the traditional method of viewing ski resort maps is evolving to meet the modern age. Of 429 North American ski resorts researched in Tait’s 2010 study, 428 (99.7%) of them provided an electronic version of their paper map on their website. In addition, 18% of all resorts and 52% of the top 100 resorts offered some sort of online interactive map. The widespread adoption of internet ski maps in recent years has facilitated the process of viewing multiple resort maps from the comfort of home, impossible before the age of the internet. The ability to view resort maps at home assists with trip planning, and allows for quick and easy comparison between resorts.

4.5 Mobile Ski Maps

Some ski resorts have implemented mobile maps that can be easily viewed on the slopes using smartphone applications (Figure 12). Mobile maps have the distinct advantage of being Global Positioning System (GPS)-enabled, which provides information of the user’s position on

the map in real-time. GPS-enabled mobile maps only became practical in 2000, when President Bill Clinton made the decision to discontinue selective availability. Selective availability was the deliberate degradation of public GPS signals for reasons of national security. When it was turned off, accuracy errors were drastically reduced from about 45 horizontal meters to just 2.8 horizontal meters (Milbert 2012). Today, the expectation to see a marker on a mobile smartphone map representing the exact the location of the user is almost universal, and is considered to be the most valuable advantage of mobile



Figure 12: GPS enabled mobile ski map of Squaw Valley, California.

maps over traditional paper maps (Nivala and Sarjakoski 2003). Some ski resort applications even offer an augmented reality feature, defined as “computer-generated views [that] are placed into or over the natural human viewfield” (Clarke 2001, 3). Augmented reality navigation systems can be served through a smartphone’s camera-view, or through wearable devices such as



Figure 13: A view from Google Glass’s wearable augmented reality navigation system at Squaw Valley, California.

goggles or glasses (Figure 13). They sometimes have the ability to recommend specific routes and provide step-by-step directions in real time.

The expansion of GPS-based mobile

navigation has prompted researchers to investigate the effects the technology has had on map literacy and spatial cognition in comparison to paper maps (Ishikawa et al. 2008, Axon et al. 2012). At this point in time, all mobile ski maps are lacking a key attribute that traditional paper ski maps possess: the ability to view the *entire* resort trail map *in detail* as a complete entity. Many details on a mobile map are too small to be seen and require zooming and panning to acquire a complete understanding of the area. By comparison, paper maps can be unfolded and spread across the lap for immediate comprehension of the trail layout and resort topography. Studies have shown that mobile map users tend to have poor topological (structural) accuracy, which may be attributed to the limited mapview on a phone screen (Ishikawa et al. 2008). Another disadvantage of mobile maps in relation to spatial understanding is that they can be distracting. Ishikawa et al. explains:

[A]s GPS users need to focus on the continuously updated information on the small screen, they pay less attention to the routes and surrounding space globally. This “local” focus of attention should interfere with the global processing of spatial information, which is required for getting oriented in space, by interrelating the surrounding space, the self, and the map. (2008, 80)

A distracted skier might inadequately observe his or her physical surroundings and become disorientated in an extreme environment, which could lead to a dangerous situation.

5. THE SPORT OF SKIING – A BRIEF HISTORY

Long before skiing was a recreational sport, it was invented as a necessity for winter transportation. More than 6,000 years ago, Siberians and Scandinavians constructed wooden skis to prevent their feet from sinking into deep snow (Fry 2006). Appropriately, the word “ski” comes from the Norwegian word “skilober” meaning snowshoe (Cohen 2007). Skiing persisted for thousands of years in Europe and Asia as a practical method of wintertime travel. In 1888,

Norwegian explorer Fridtjof Nansen captivated millions of Europeans when he successfully led the first team across Greenland's interior on skis (Fry 2006). Nansen's momentous accomplishment can be considered the event that catalyzed skiing's popularity in the 1890s, beginning the evolution of skiing into the recreational sport we know today.

Among the first to ski in North America were rural postmen and preachers, generally of Norwegian heritage, that used skis to travel to remote mountain villages (Fry 2006). By the late 1800s, "ski-jumping" was popularized by Scandinavian immigrants in Michigan, Minnesota, Wisconsin, Illinois, and British Columbia. Spectators would gather to observe ski-jumpers speed down hillsides and launch off ramps high into the air. In the Upper Peninsula of Michigan, the popular past-time sparked the formation of one of North America's longest lasting ski clubs, which would eventually evolve into the U.S.

Ski and Snowboard Association (Fry 2006).

The creation of several other ski clubs in America soon followed, providing recruitment opportunities for the developing sport. Popular traveling circuses in the early twentieth century featured ski-jumping as a "death-inviting" act that expanded

recognition of the new sport (Fry 2005;

Figure 14).



Figure 14: A Barnum and Bailey circus poster featuring Captain Carl Howelson ski-jumping in 1907. Accessed from www.treadofpioneers.com on April 28, 2015.

Although skiing was gaining popularity, participation was limited to those who were willing and able to make the arduous trek into the mountains during the winter months. A method of transportation was desperately needed to carry city dwellers to the slopes. In 1927, the

first “ski train” in North America ran 50 miles north from the city of Montréal to the Laurentian Mountains, making the destination significantly more accessible (Murphy 1975). Over the next several years, many other ski trains opened across North America. Residents in Chicago could hop on special ski trains to resorts in Wisconsin or Minnesota. On the west coast in the 1920s, San Franciscans could journey to the mountains on the Central Pacific Railway’s “Snowball Express” to Lake Tahoe (Ancinas 2014). In the Rockies, Colorado skiers could ride through the Moffat Tunnel under the continental divide to the base of what is Winter Park Resort today (Fry 2006). Thanks to numerous new ski trains, skiing was becoming more accessible than ever before. It is estimated that during President’s Day weekend in 1936, 300,000 people boarded trains in New York and New England to go skiing (Langely 1937).

The increased influx of skiers brought by the trains demanded a more efficient method of moving people up the slopes. Traditionally, skiers trudged through deep snow up the ski slope while carrying bulky equipment. In 1931, the first rope-tow was introduced at a ski area near Montréal and became an immediate success. The revolutionary invention, consisting of no more than a rope strapped around a series of pulleys and powered by a car engine, allowed skiers to be effortlessly pulled up the mountain. Not only was skiing more accessible because of the trains, it was becoming easier and more enjoyable. More people flocked to ski areas, enticed by the new rope-tows appearing all over North America. Entrepreneurs began building warming huts and selling hot food and drinks at the base of the slopes, setting the stage for the creation of the modern ski resort in North America (Fry 2006).

In 1935, the chairman of the Union Pacific Railroad, Averall Harriman, dreamed of opening a ski resort in North America similar to the impressive ski areas he had seen in Europe. He hired an Austrian ski resort developer, Count Felix Schaffgotsch, to scout the mountains of

the West for an ideal location for his grand resort. After many unsuccessful mountain surveys, Schaffgotsch finally stumbled across a location in central Idaho that satisfied Harriman's strict criteria. Harriman quickly bought 4,300 acres of mountainous terrain and built Sun Valley Resort, featuring the first ski chairlifts in the world. The resort opened to the public in 1936 with a resounding success, and the first modern destination ski resort was born (Sun Valley Resort 2015).

Chairlifts quickly spread across the country, and the popularity of skiing continued to increase. The first ski schools were created in the late twenties and early thirties, which were critical to the progression of the sport. Wealthy aristocrats witnessed the prosperity of Sun Valley and invested in the construction of several similar resorts, including Sugar Bowl in California and Aspen in Colorado (Fry 2006).

At the eve of World War II, there was somewhere between 200 and 300 ski areas in North America equipped with rope-tows, but only a handful had chairlifts. However, the magnitude of the war put resort construction on a hiatus from 1941 to 1946. Valuable resources, like steel, were dedicated to the war efforts and as a result construction of resort infrastructure essentially ceased. In California, the railroad connecting Truckee to Lake Tahoe was torn up and melted as scrap metal (Lankford 2005). Sun Valley Resort was even temporarily converted into a Navy recovery hospital from 1943 to 1946 (Associated Press 1943).

As World War II came to an end, skiing regained its pre-war popularity. A unique ski culture was evolving, and people began to view it as more than just a sport. In 1948, Otto Schniebs, a skier from Germany, was quoted in the *New York Daily News* as saying, "Skiing is not a schport, it is a vay of life." Schniebs was referring to the belief that the devoted skier

doesn't just ski, "he or she enters into a culture, an ambiance of comradeship and a transcendent love of the mountains" (Fry 2006, 25).

In the early sixties, advancements in gear and resort technology dramatically increased the price of skiing. Snow-making and grooming guaranteed skiers ideal slope conditions, but came with a cost. Skiing was no longer a relatively affordable wintertime activity. Despite the increase in cost, ski participation in the 50s and 60s doubled every five to six years (U.S. Department of Commerce 1962-63). By the winter of 1965-1966, North America was home to 662 ski areas, and newly paved interstate highways made it easy to get to them (Tanler 1966, Fry 2006). Ski resorts were being built faster than ever, and the formation of the National Ski Areas Association (NSAA) in 1962 helped unite over four hundred resorts (Fry 2006). In 1964, the NSAA standardized the degree of difficulty to be posted on the slope. Three years later, the symbols evolved into the signs we see today: a green circle for easiest, a blue square for more difficult, and a black diamond for most difficult trails (Fry and Cram 2012).

The first wave of baby boomers were in their late teens in the 1960s, and skiing was the adrenaline-inducing sport they craved as a distraction from the somber Vietnam War. Ski resorts soon became a place where the young and rich united, molding the resorts into a socially-desirable "cool" place to be. The Kennedy family's highly photographed Christmas vacation at Aspen during the winter of 1964 further solidified skiing's new recognition as a sport worthy of the rich and famous (Fry 2006; Figure 15). In order to keep up with the growing



Figure 15: Caroline and Jackie Kennedy on vacation at Aspen, 1964. Accessed from www.carolinecovets.com on April 28, 2015.

popularity of skiing, the old mining and logging towns at the base of many resorts expanded to fit the needs and expectations of the middle and upper-class visitors. To help establish the exclusive quality of these developing towns, elaborate resort maps were created that also helped to attract new visitors. Hal Shelton, a painter and cartographer from Colorado, was one of the first artists to actually sell the idea of producing a beautiful and intricately detailed map to the ski areas (Weyland 2004).

Beginning in the late 1960s, the expansion of the ski industry began to shift. Instead of constructing dozens of new resorts each year, existing resorts sought to expand in size (Fry 2006). In 1971, Breckenridge Resort in Colorado introduced Peak 9 that added 12 trails and two lifts to the existing resort (Vail Resorts Management Company 2014). At Winter Park Resort, also in Colorado, the addition of Mary Jane Mountain in 1975 added 350 acres and increased the size of the resort by 80% (Winter Park Resort 2014).

The number of ski areas in North America peaked at over 700 in the mid-1970s. In the following years, several factors contributed to the falling number of ski areas. Many small resorts went out of business when they could not afford to compete with other massive resorts. In 1970, the National Environmental Policy Act (NEPA) was enacted requiring an environmental impact analysis statement for any building on public land (Fry 2006). Ski resorts were no longer a quick and easy entrepreneurial construction project; they required years of research and the probability of being granted permission to break ground was largely unpredictable. In addition, the cost of insurance rose sharply in the wake of multiple lawsuits, which further hindered resort development. Despite the slowed construction of new ski resorts, people continued to flock to the mountains. Lift capacity doubled after 1985, thanks to new cable technology (Fry 2006).

The sport of snowboarding experienced a massive increase in popularity in the 1990s, pioneered by enthusiasts Jake Burton, Tom Sims, and others (Fry 2006). It was initially shunned by many resorts under the belief that inexperienced boarders scraped the snow off of the slopes. In 1985, snowboarding was permitted at only seven percent of American ski resorts (Phillips 2001). Throughout the 1990s, snowboarding gradually gained acceptance at resorts as the technique and equipment developed. The fresh sport appealed to 18 to 24 year olds, who jumped at the opportunity to participate in “the coolest sport in existence” (Marquardt 2008). A surge of young people flocked to the slopes, and by the end of the century one in every three visitors to ski resorts was a snowboarder (National Ski Areas Association 2001/02).

Around this time, environmentalists began to express concern about the impact of ski resort development (Fry 2006). The Sierra Club, a grassroots environmental organization, published *Downhill Slide* in 2002, which portrayed corporate ski resorts as ringleaders for mountain habitat degradation (Clifford). Andrea Mead Lawrence, a retired Olympic skier was quoted saying, “God did not make the eastern Sierra Nevada as a lot-and-block subdivision,” and she created a nonprofit conservation organization to discourage mountain development (Martin 2009). The backlash was caused in part by the gradual shift from small family owned resorts to multi-million dollar corporations owning and operating dozens of resorts. Increasingly, ski resorts across North America were bought out by just a few large companies, such as Intrawest, Vail Resorts, and the American Ski Company. Construction surrounding resorts progressed, as the ski corporations worked to provide all-inclusive vacation experiences that consisted of shopping and fine dining as much as it did skiing.

The criticism from people unhappy with the state of the ski industry put a damper on the construction of new ski resorts throughout the twenty-first century, but visitation to existing

resorts continued to soar. A record 60.5 million people went skiing or snowboarding in the winter of 2010/11 in the United States, and many million more hit the slopes in Canada (National Ski Area Association 2012/13).

6. METHODOLOGY

A combination of quantitative and qualitative methods was used to conduct this study. This section summarizes how key-informant interviews, an Access database, and a quantitative survey were used to obtain useful information to be analyzed in the discussion. The methods involving human subjects were approved for use by the Institutional Review Board at the University of Montana.

6.1 Key Informant Interviews

A key informant interview is a special type of interview involving a single or group of subjects who have extensive knowledge of a specific topic (Education Development Center 2004). Key informant interviews were used in this study to obtain vital information about ski mapping that could not be retrieved elsewhere.

The format of the interviews was semi-structured. A semi-structured interview is defined as “a verbal interchange where one person, the interviewer, attempts to elicit information from another person by asking questions” and are usually conversational and informal (Clifford et al. 2010, 103). This type of interview allowed for flexibility in the conversation.

The first key informant interview was conducted with James Niehues. Since 1988, Niehues has painted over 240 ski maps for clients all over the world. He is currently the dominate artist in the United States ski mapping industry, making him a very relevant key-informant for this thesis. The interview took place over the phone on Monday, February 9th, 2015

at 3:30pm and lasted 24 minutes and 15 seconds. It was recorded using an Olympus digital voice recorder and later transcribed by the author.

The second key informant interview was conducted with Alex Tait. In 2010, Tait published the article “Mountain Ski Maps of North America: A Preliminary Survey of Analysis and Style,” which served as the inspiration for this project. The format of the interview was also semi-structured. The interview took place over the phone on Friday, April 3rd, 2015 at 1:00pm and lasted 12 minutes and 14 seconds. It was recorded using a Sony microcassette-corder and later transcribed by the author.

6.2 Creating a Database of Ski Resort Maps

The first step in analyzing the evolution of ski resort map style and design was to create a database of available ski maps. A Microsoft Access database was created to catalogue, organize, and examine the maps. A “form” was designed in Access utilizing dropdown menus and checkboxes to alleviate the repetitive process of classifying the maps (Figure 16). This was the

The screenshot shows a Microsoft Access form titled "SkiMapForm" with a "SkiMaps" title bar. The form contains the following fields and values:

ID	37
State	Arizona
Name of Resort	Sunrise Park
Year	2009
Color Type	full color
View Type	panoramic
Creation Method	painted (hand or computer)
North Arrow	<input type="checkbox"/>
Clouds	none
Artist	Unknown
Trail Rating	standard
Notes	
Map	E:\Thesis\Maps\Arizona\SunrisePark2009.jpg

To the right of the form is a preview of a ski trail map titled "Trail Map". The map shows a mountain range with several ski trails. Key features include "Sunrise Peak 10,700'" and "Apache Peak 11,100'". The trails are color-coded and labeled with names like "SUNRISE", "APACHE", and "LOOPER". There are also icons of ski lift towers and a small orange area at the base of the mountain.

Figure 16: A screenshot example of the form created in Microsoft Access used to enter ski maps into the database.

author's first time using the Microsoft Access program, and it was discovered well into the cataloguing process that a better database management method existed. Only a single table was created to hold all the information in the database, when several tables should have been created to take advantage of Access' data management abilities. This did not, however, detract from the quality or accuracy of the data. To examine the data, a report was created in Access and the maps were sorted by multiple levels depending on what was being analyzed. For example, to find the first year that a computer-rendered map was seen, the database was sorted first by creation method and then by year.

Maps were obtained from skimap.org, a website founded in 2008 that is self-described as having the most ski resort trail maps on the internet. The site contains approximately 4,650 individual maps for hundreds of resorts in the United States and Canada. Many maps that were of cross-country ski areas or not used as the official resort map were not entered into the database. Additionally, many resorts use the same trail map for several years with small updates to the legend, trails, symbols, logo, etc. As long as the main background image of the trail map did not change significantly, repeated uses of the same trail map each year were excluded from the database. However, if the same background image was utilized by a resort for over a decade, a map was entered separately for each decade it was in use. The purpose for creating this database was 1) to allow the author to become expertly acquainted with ski resort maps of all kinds and 2) to create a database with relevant attribute information of modern and historical ski resort maps in North America. The following attribute information was collected for each map:

- 1. State or Province**
- 2. Name of Resort**
- 3. Year Published**

4. Color Type

- full color
- partial color or limited color
- grayscale
- black and white
- sepia

5. View Type

- panoramic
- profile
- planimetric
- panoramic/profile

Maps were categorized as “panoramic” if they viewed the terrain at any oblique angle, ranging from nearly horizontal to nearly vertical. Also, these maps usually made an attempt at shading or perspective. The “profile” maps viewed the terrain at a very low oblique or horizontal angle, and often lacked shading, depth, and perspective. The view types of some maps were difficult to differentiate between panoramic and profile, and a new view type was made shortly into the cataloguing process labelled “panoramic/profile.” These maps usually viewed the terrain at any angle, but minimal effort was put into shading and perspective. Planimetric maps viewed the terrain from directly above, in the style of a traditional topographic map.

6. Creation Method

- painted (hand or computer)
- illustrated (hand or computer)
- photographed
- computer rendered
- unsure

Maps that used satellite images draped over a DEM were categorized into the computer rendered creation method.

7. Presence of North Arrow

- present
- not present

8. Presence of Clouds

- no clouds present
- some small clouds/mist/fog
- large prominent clouds

Clouds were categorized as “large and prominent” if they covered more than 50% of the visible sky and were a conspicuous element of the map. Maps that did not show the sky at all (many profile and planimetric view types), were categorized into the “no clouds present” category.

9. Artist (if known)

10. Trail rating system displayed

- standard
- non-standard
- none

Standard trail ratings were defined as a green circle for the easiest, blue square for the more difficult, and black diamond for the most difficult trails (sometimes a double or triple black diamond is used to identify expert-only trails). In some cases, the map identified the trails using the standard colors or shapes, but not simultaneously. For example, some grayscale maps labeled trails with the standard shapes, but did not display the standard color. In cases like this, the map was still categorized as utilizing the standard trail rating.

11. Miscellaneous Notes

12. Location of file

All of the maps were downloaded and saved as a .jpg, .gif, or .png file, and the path to the file was noted in this field.

6.3 Quantitative Survey

The online survey for this study was created using Qualtrics Survey Software. Skiers and snowboarders over the age of 18 were invited to participate in the survey, and respondents were automatically entered into a raffle for a lift ticket to Montana Snowbowl. The purpose of the survey was to assess skiers’ preferences, understandings, and expectations of modern ski resort maps. Flyers were distributed physically throughout the city of Missoula, Montana, and digitally via social media. All respondents were self-selected and were directed to the online survey by a URL link printed on the flyer.

The survey was hosted online in order to conduct it in a timely manner and to decrease printing costs. Usually, hosting a survey online has the issue of coverage error because some people do not have access to the internet and would be unable to participate in the survey. Today, most people who do not have access to the internet are either low income or elderly. Skiing, especially at ski resorts, is a rather expensive sport to participate in. Because of the high cost of skiing, many low-income people would be unlikely to be in the study population. To support this claim, a study by the National Ski Areas Association (NSAA) in 2007 found that skiers and snowboarders tend to be wealthier than the average population. The same study also found that the average age of skiers and snowboarders is 36.6 years old (Associated Press 2007). These facts minimize the coverage error common with internet surveys for this particular project.

The survey itself consisted of 26 questions. The question styles used were a mixture of dichotomous (yes/no), demographic, open-ended, multiple choice, and Likert Scale. The Likert Scale was developed by Rensis Likert in 1932 as a way to measure attitudes or opinions. Likert scale responses usually consist of three to seven fixed choices that range from strongly negative to strongly positive, with a neutral or moderate choice in the middle (McLeod 2008). The Likert Scale was used in this survey to determine how frequently skiers use ski maps, how well they typically understand ski maps, and how important north arrows are for navigation. The survey can be viewed in Appendix 1.

6.4 Historic Review of Ski Map Artists

The final methodology used in this thesis was simply reading magazine articles, books, and interviews to understand the background and personal style of ski map artists over the years. The key-informant interviews and creating the database of ski maps also helped to accomplish this goal.

7. RESULTS

7.1 Key Informant Interviews

The transcriptions of the interviews with James Niehues and Alex Tait can be viewed in appendices 2 and 3.

7.2 Ski Resort Map Database

A total of 1,779 ski resort maps from 48 states and provinces/territories were catalogued into the database. The oldest two maps in the database were from 1936, at Bousquet Ski Area in Massachusetts and Mt. Baker Ski Area in Washington. It is important to emphasize the fact that this is not a complete database of every ski map ever produced in North America. Firstly, this database is limited only to maps hosted on skimap.org. Secondly, many older ski maps have been lost, damaged, or simply do not exist in a digital format. As a result, 52% of maps in the database are from 2000 or later, and only 2% of the maps are from 1960 or earlier. Furthermore, the database includes some duplicates for reasons explained in the “Methods” section. Because of these reasons, the results of the database provide a thorough, *but not exact*, story of ski map history. For example, a claim such as “72.4% of North American ski maps are panoramas” is illegitimate and should not be made when referring to this database.

The vast majority of the maps entered into the database did not display north arrows of any kind (Table 1). Of those that did, the design of the north arrow differed considerably in terms of size and style.

Table 1: Existence of North Arrow Results

North Arrow	Amount
No	1674
Yes	105

Panoramic maps were by far the most common view type of map entered into the database (Table 2). An example of a map that was ultimately labelled as a “panoramic/profile” view type is seen in Figure 17.

Table 2: View Type Results

View Type	Amount
panoramic	1288
profile	306
panoramic/profile	147
planimetric	38

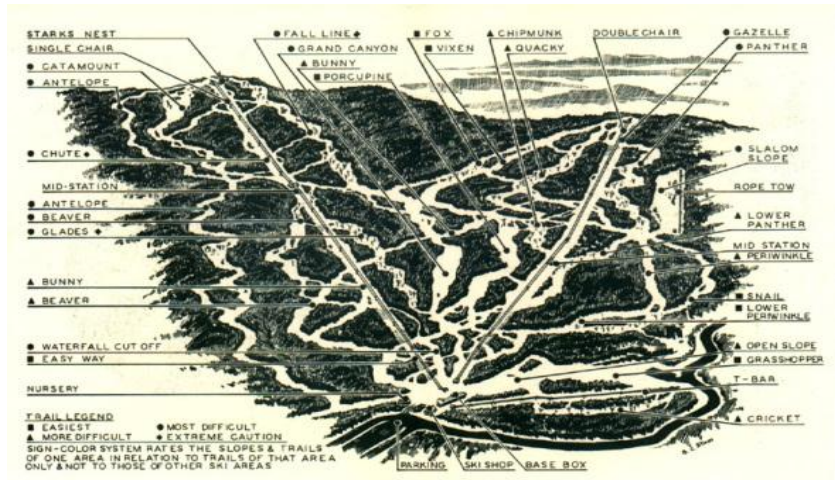


Figure 17: Mad River Glen, Vermont. Artist Unknown, 1965. An example of the “panoramic/profile” view type. Accessed from skimap.org on April 29, 2015.

Most maps in the database were full color (Table 3). Some maps, especially the older ones, used different color approaches, such as grayscale or partial/limited color. An example of a map using the partial/limited color approach can be seen in Figure 18.

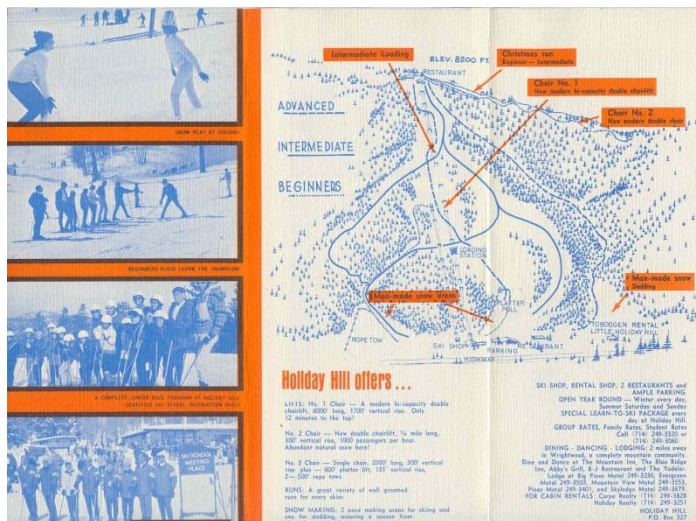


Table 3: Color Type Results

Color Type	Amount
full color	1332
grayscale	219
partial/limited color	180
black and white	46
sepia	2

Figure 18: Mountain High, California. Artist unknown, 1976. An example of the partial/limited color approach, seen here using only orange and blue. Accessed from skimap.org on April 29, 2015.

The majority of maps in the database displayed no clouds in the sky (Table 4). A sizeable amount of maps displayed “some small clouds/mist/fog,” and a very small amount exhibited “large prominent clouds” on the trail map. An example of a map with large prominent clouds can be seen below in Figure 19.

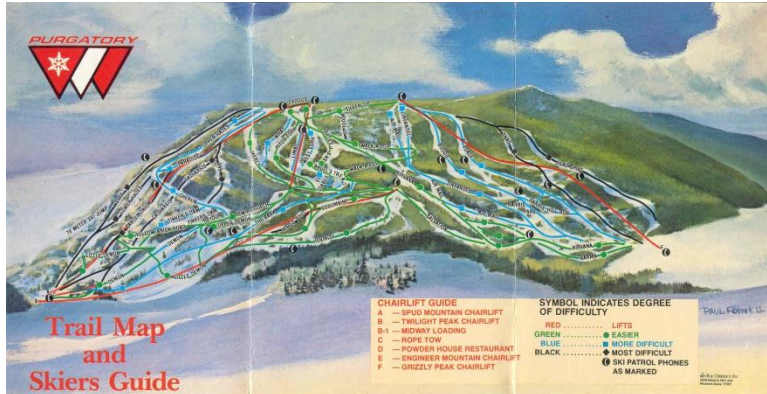


Table 4: Clouds Results

Clouds	Amount
none	1405
some small clouds/mist/fog	359
large prominent clouds	15

Figure 19. Purgatory, Colorado. By Paul Fowell, 1979. An example of a trail map with large prominent clouds. Accessed from skimap.org on April 29, 2015.

The majority of maps in the database displayed standard trail ratings somewhere on the map (Table 5). Standard trail ratings were defined as a green circle for the easiest, a blue square for the more difficult, and a black diamond for the most difficult trails (Figure 20). Non-standard trail ratings were especially common prior to 1980.

Table 5: Trail Ratings Results

Trail Rating	Amount
standard	1485
none	192
non-standard	102



Figure 20: An example of the standard trail rating system as seen on the map of Camden Snow Bowl, Maine in 2014. Accessed from skimap.org on April 29, 2015.

Painted maps were by far the most common creation method seen within the database (Table 6). Hand-painted maps were especially prominent, comprising the majority of the maps in the painted category and seen consistently throughout the years. In the earlier decades, illustrated maps were drawn by hand using ink. Hand-illustrated maps became less common as the years passed, and were slowly replaced by other creation methods. Photographed ski maps were not common, but appeared consistently throughout the years. Computer-rendered maps were the least common overall, first appearing in the late 1980s.

Table 6: Creation Method Results

Creation Method	Amount
painted (hand or computer)	1055
illustrated (hand or computer)	371
unsure	237
photographed	96
computer-rendered	20

The majority of maps had no clear attributions, and were labeled as unknown (Table 7). James Niehues had the highest amount of identifiable maps by far, with his hand-painted maps first appearing in the late 1980s. Ski maps by Bill Brown (a hand-painter) first appeared in the late 1960s and were used by some resorts until the present. Maps by Murray Hay (also a hand-painter) first appeared in the early 1980s and were also used until the present. VistaMap (computer-illustrated maps by Gary Milliken) had the highest amount of identifiable maps that were not hand-painted, first appearing in the mid 1990s.

Table 7: Artist Results

Artist	Amount
Unknown	1204
James Niehues	242
Other (identified artists with 2 or fewer maps)	131
Bill Brown	69
Murray Hay	37
VistaMap	31
Hal Shelton	12
Terragraphics	10
K. M. Mastin	7
Donald Moss	5
Heinrich Berann	5
D. Molenaar	4
Bob Vogel	4
Maydok	3
Arnold Roberts	3
Gerry Repp	3
Paul Folwell	3
Steve Fick	3
Alex Tait	3

Maps by Hal Shelton (another hand-painter) were first seen in the late 1960s and used until the late 2000s. Painted maps by K.M. Mastin appeared in the mid 2000s and are in use by some resorts today. Terragraphics (run by Peter Powers) is the only artist in the above table that uses the computer-painted method, with their maps first appearing in the mid 1990s. The rest of the artists on the list, excluding Alex Tait, paint the map by hand. Alex Tait uses the computer-rendered technique.

The raw data compiled into the Access database can be seen in appendix 4.

7.3 Quantitative Survey

A total of 162 people participated in the survey hosted online by Qualtrics. Due to a technical glitch, several people were not able to complete the survey once they began. Because of this impediment, and various other reasons, only 126 people completed the survey in full. All incomplete surveys were deleted and not used in the analysis. The estimated coordinates of the respondents' IP addresses (recorded by Qualtrics) have been mapped in Figure 21. The majority of respondents were located in Montana, but more out-of-state people than expected participated in the survey thanks to the flyer being shared on social media. One individual IP address was mapped to the United Kingdom and was excluded in the analysis because it was not in North America, bringing the final amount of respondents to 125. The following graphs and charts display the results of the 125 qualified respondents that participated in the survey. A printed version of the complete survey can be seen in appendix 1.

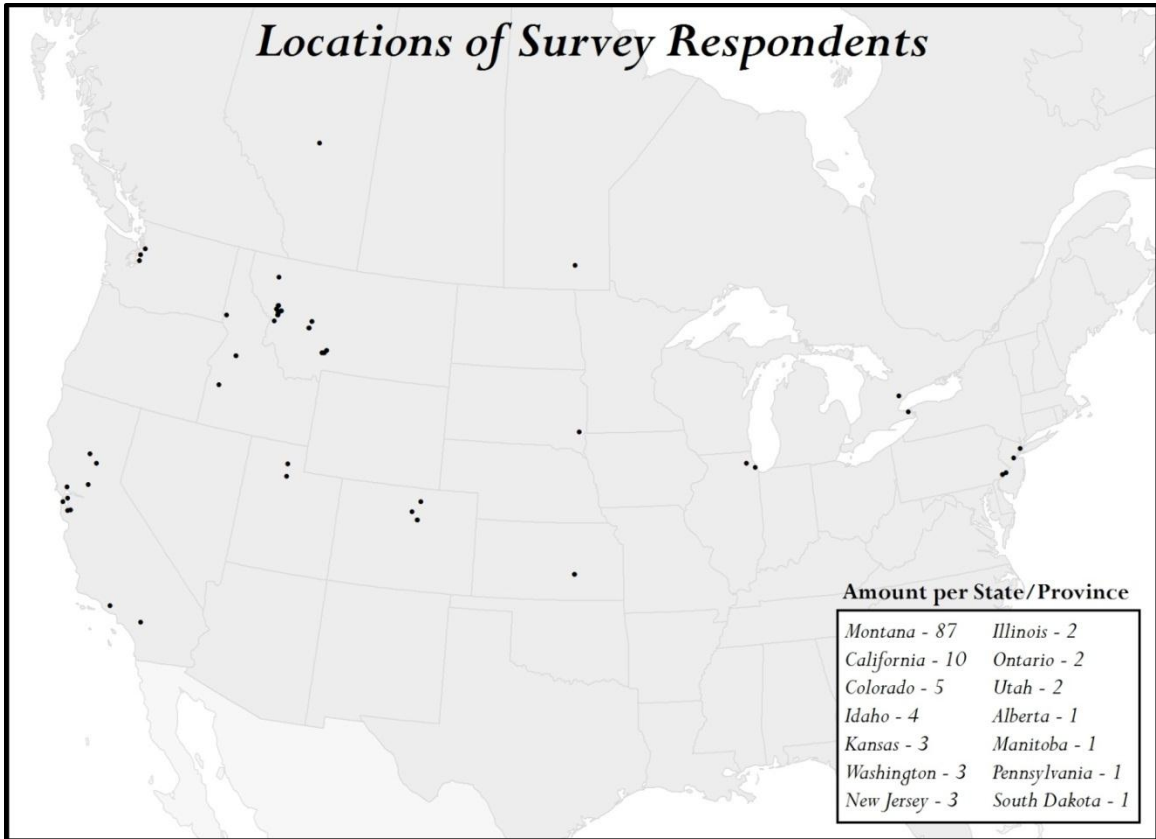


Figure 21: A map locating the IP addresses of 125 final survey respondents. Map by Amy Lippus, 2015.

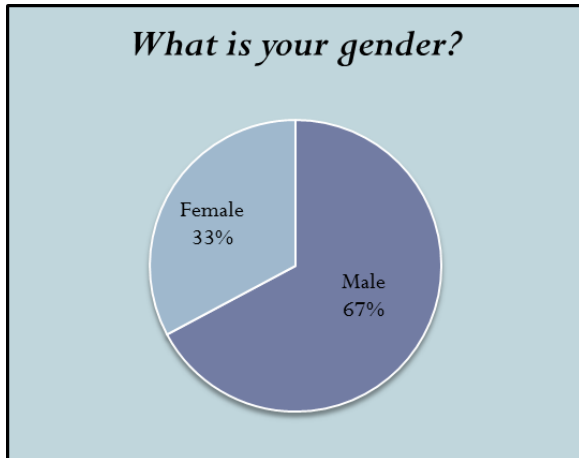


Figure 22: This pie chart shows the gender of survey respondents. Only a third of respondents were female.

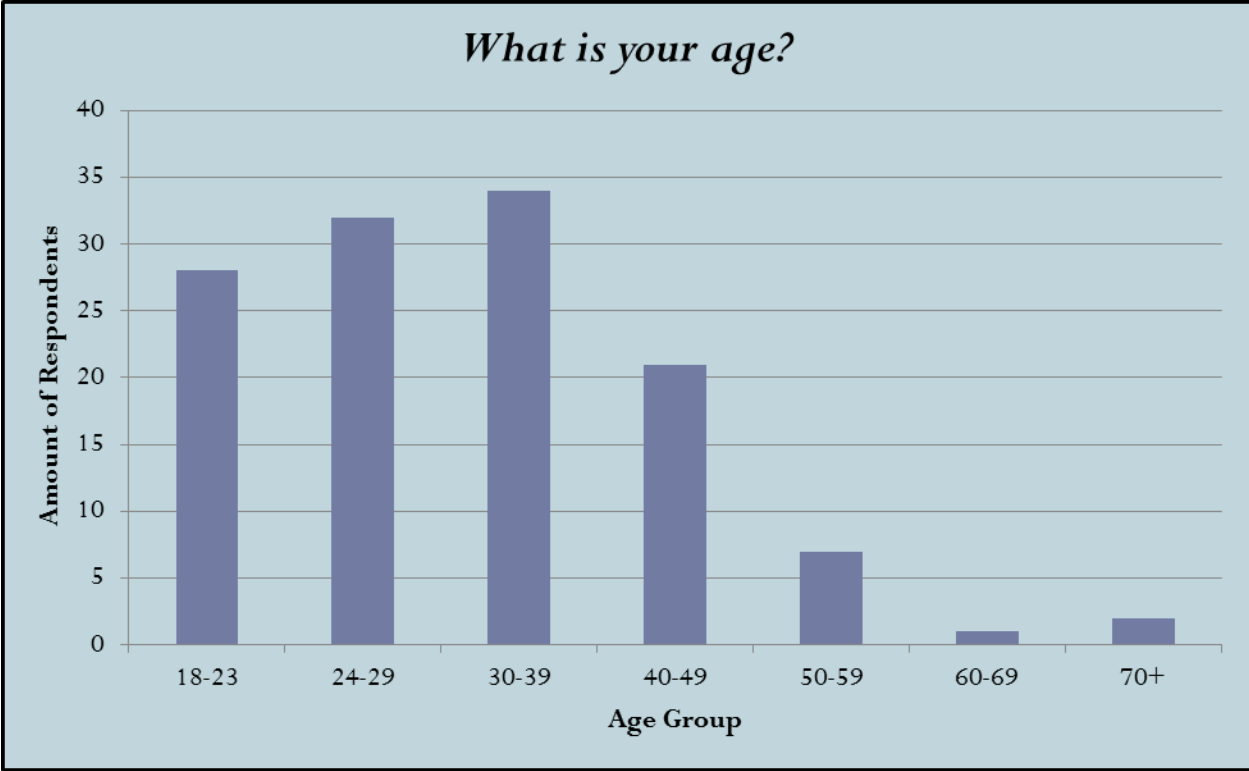


Figure 23: This bar graph shows the age of the survey respondents. Most of the respondents (75%) were younger than 40 years old.

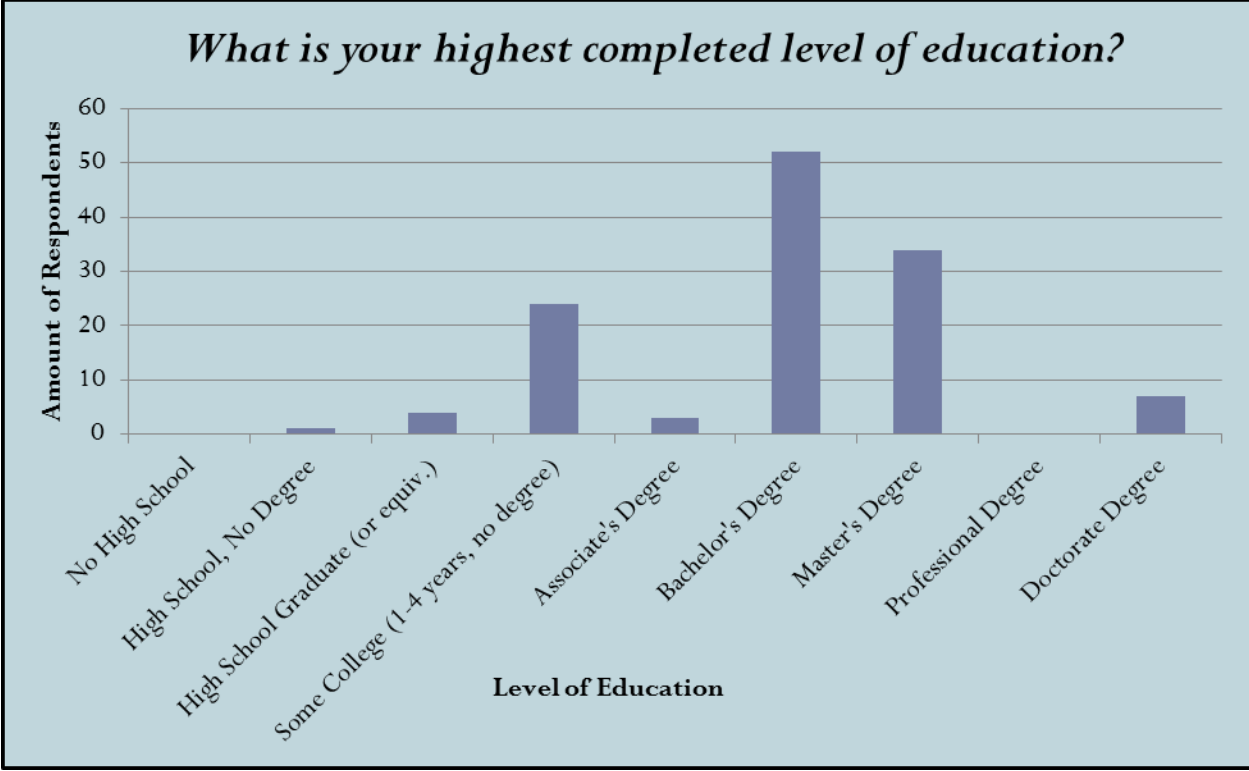


Figure 24: This bar graph shows the education levels of the survey respondents. The majority (69%) held a bachelor's or master's degree.

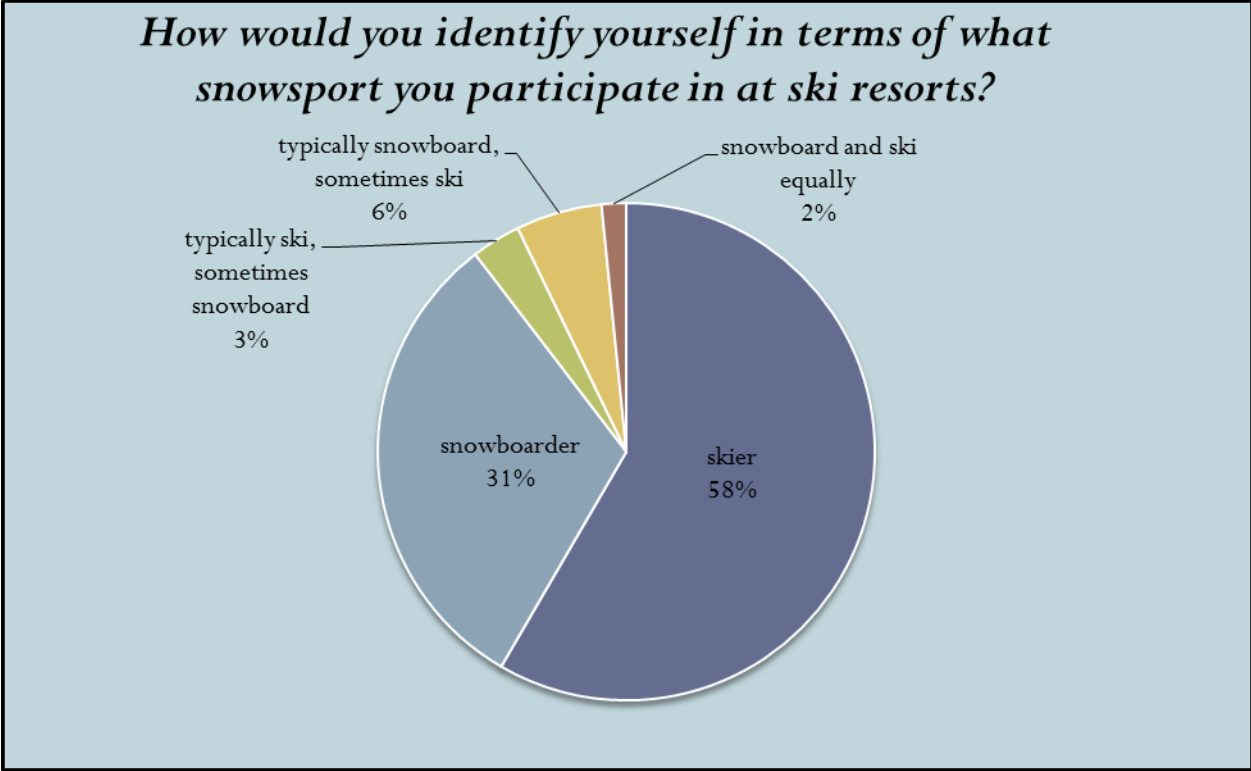


Figure 25: This pie chart shows which snowsports survey respondents participate in at ski resorts. The majority (58%) of respondents were skiers.

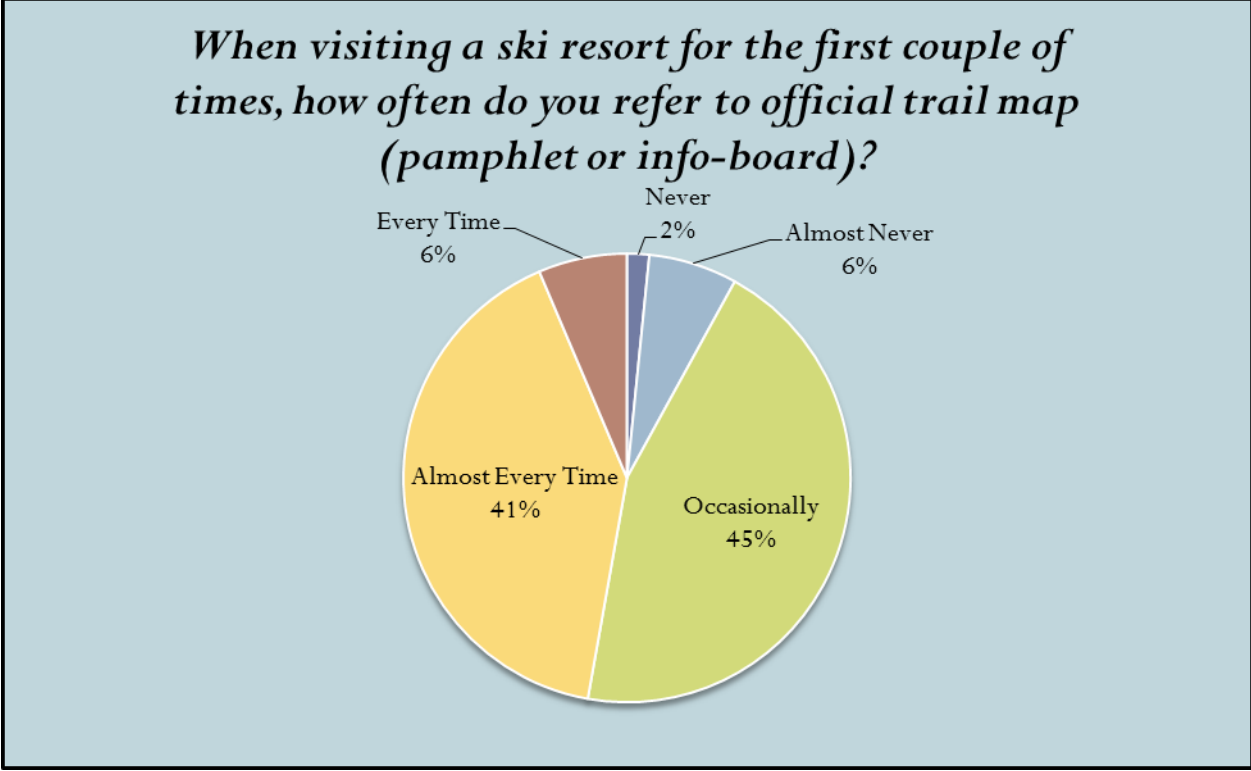


Figure 26: This pie chart shows how often survey respondents use the trail map when visiting a ski resort for the first time. The majority of respondents stated that they use the trail map occasionally or almost every time.

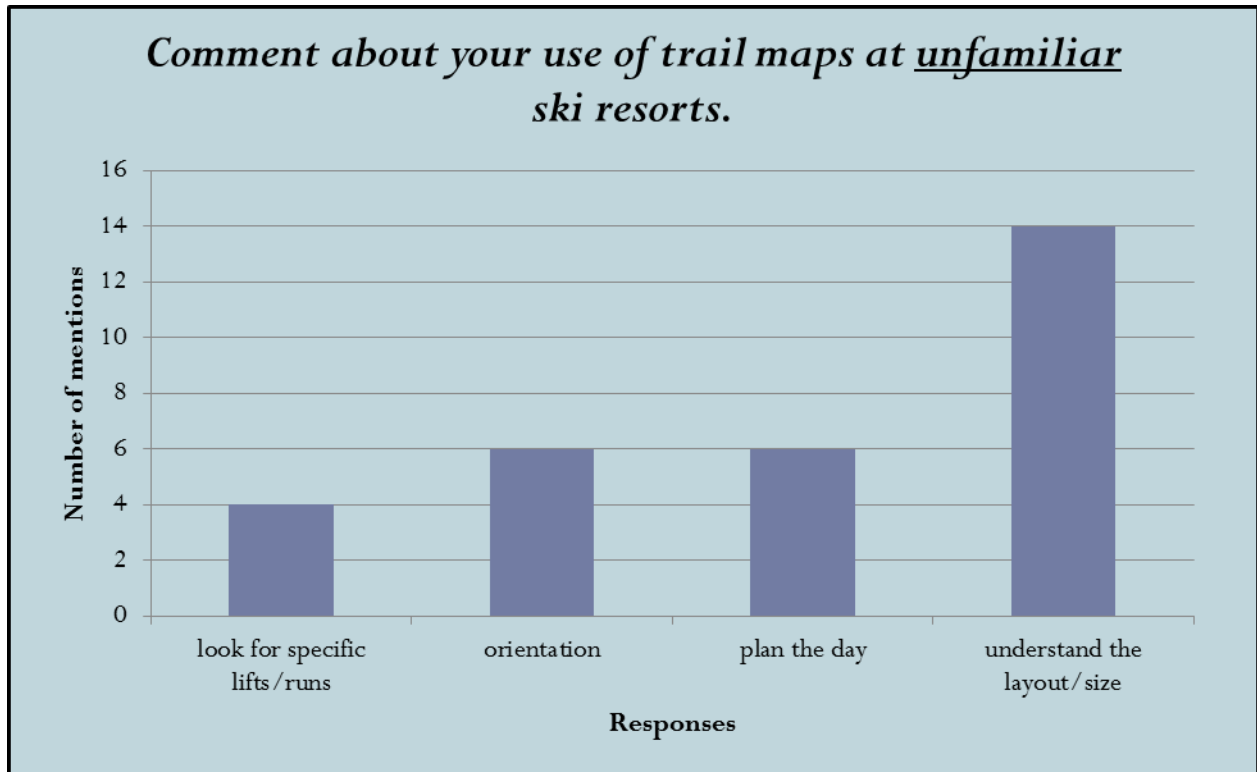


Figure 27: This bar graph shows why respondents use trail maps at unfamiliar ski resorts. Many respondents commented that they use the map to understand the overall layout and size of the resort.

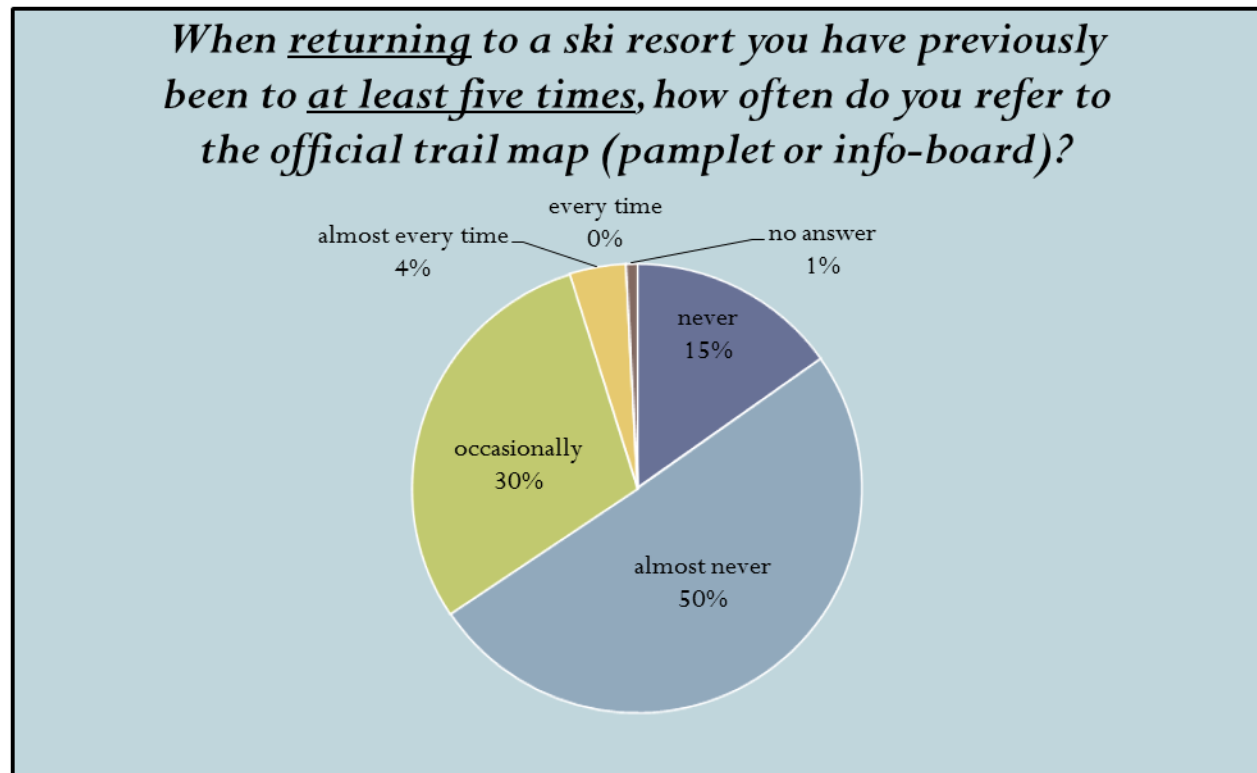


Figure 28: This pie chart shows how often survey respondents use the trail map when returning to a familiar resort. Half of the respondents stated that they almost never use it.

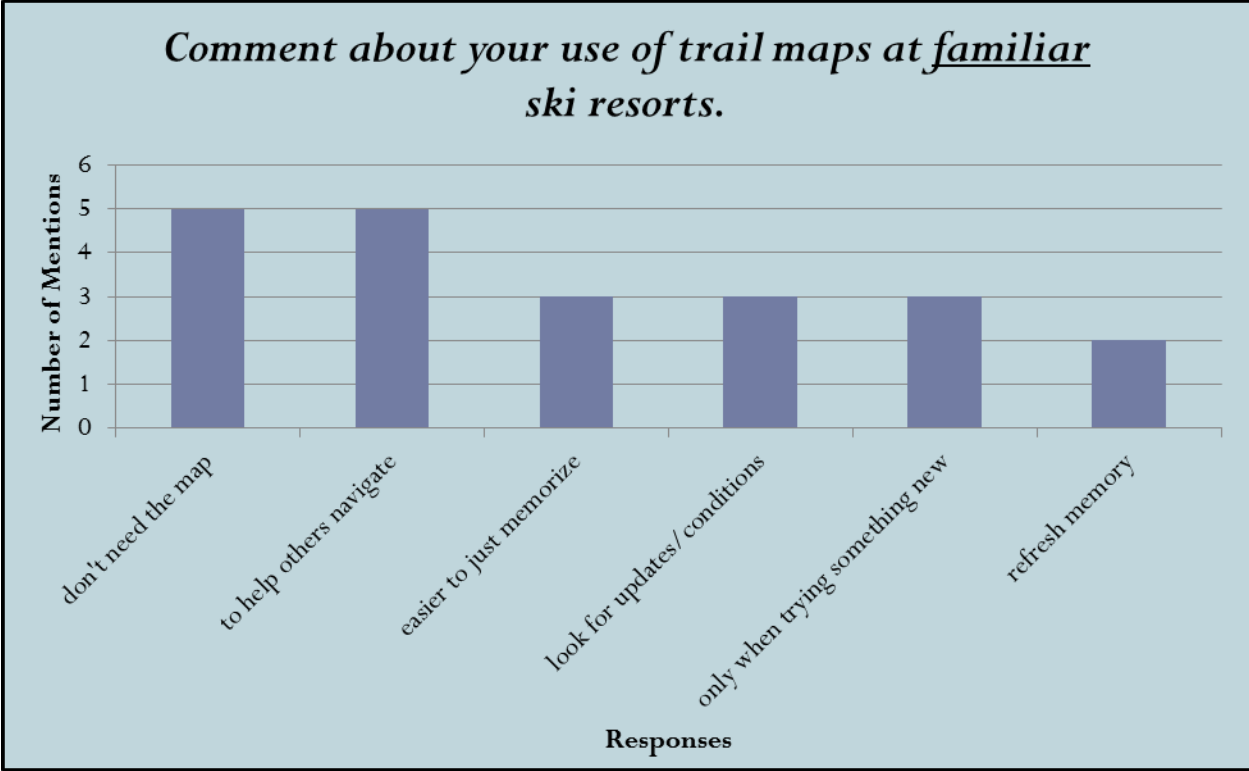


Figure 29: This bar graph shows why respondents use trail maps at familiar ski resorts. Several respondents mentioned that they simply don't need the map or only use it to help others navigate.

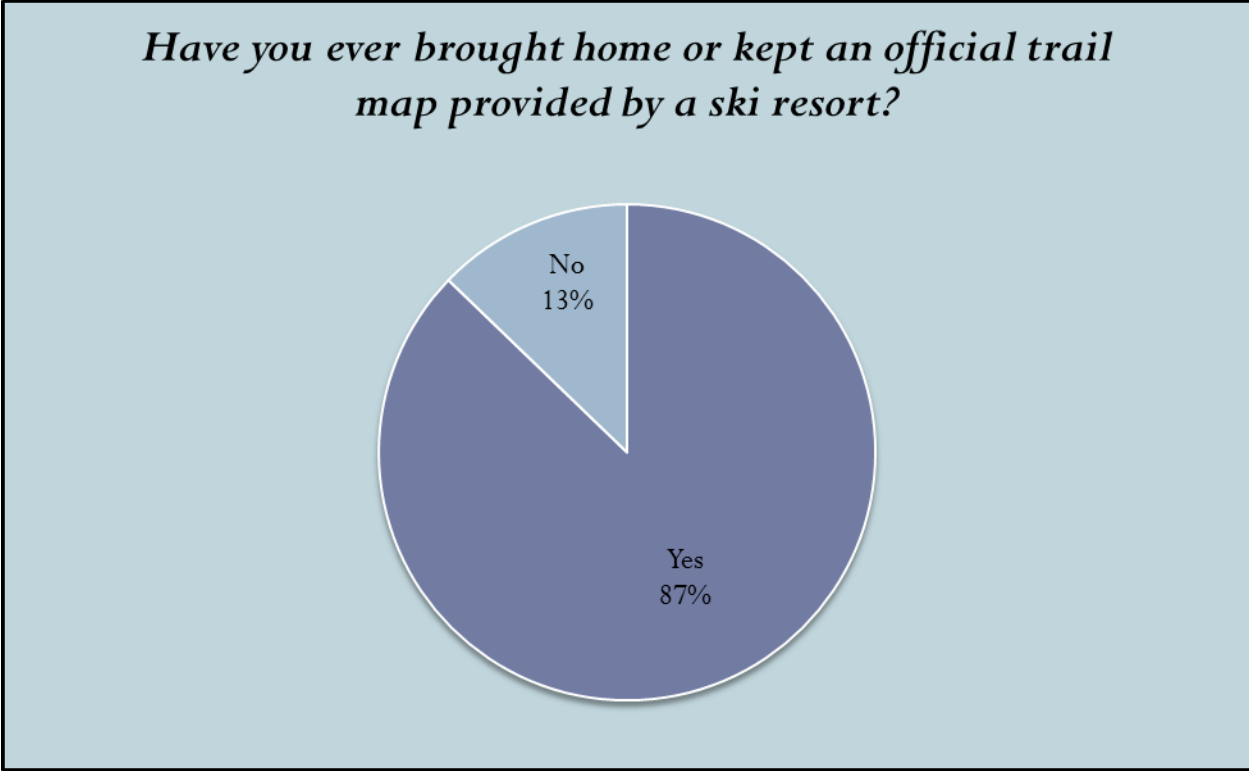


Figure 30: This pie chart displays the percentage of respondents that have ever brought home or kept an official trail map provided by a ski resort. The majority of respondents have kept a trail map at some point in time.

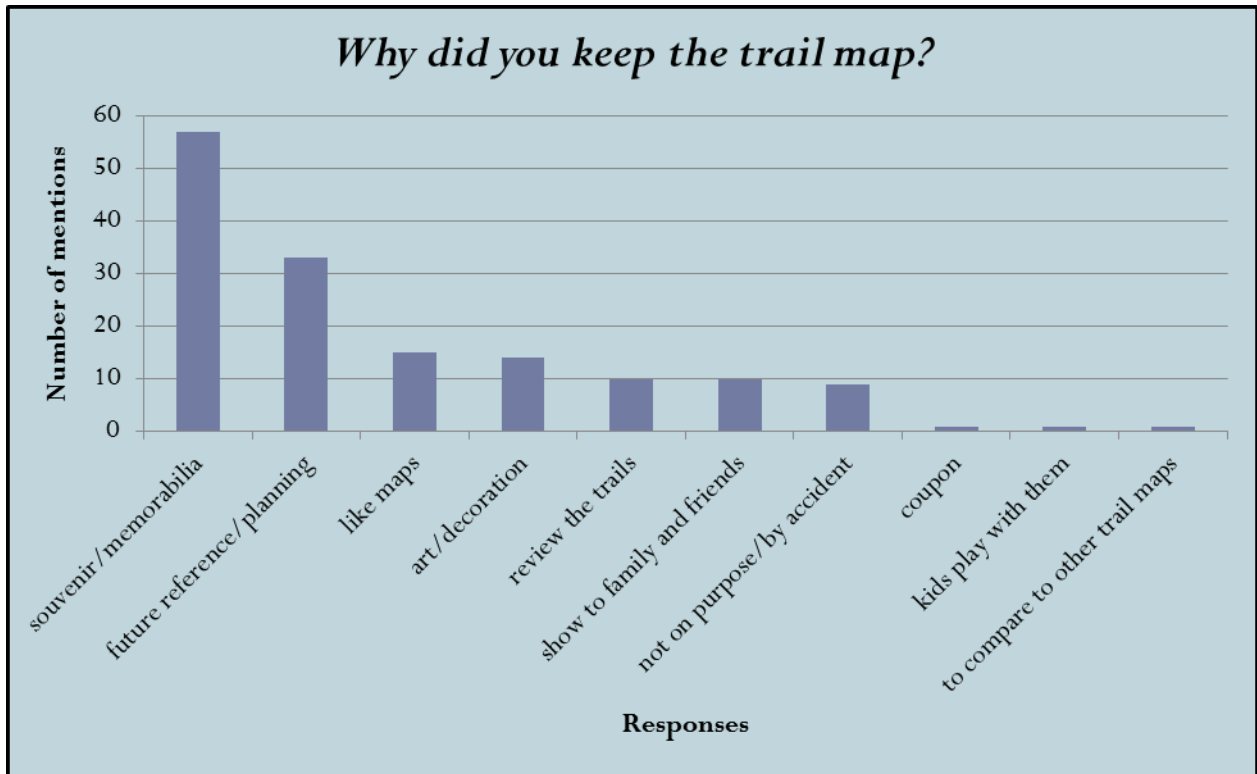


Figure 31: This bar graph shows why respondents kept the trail map. Many respondents commented that they kept the map as a souvenir.

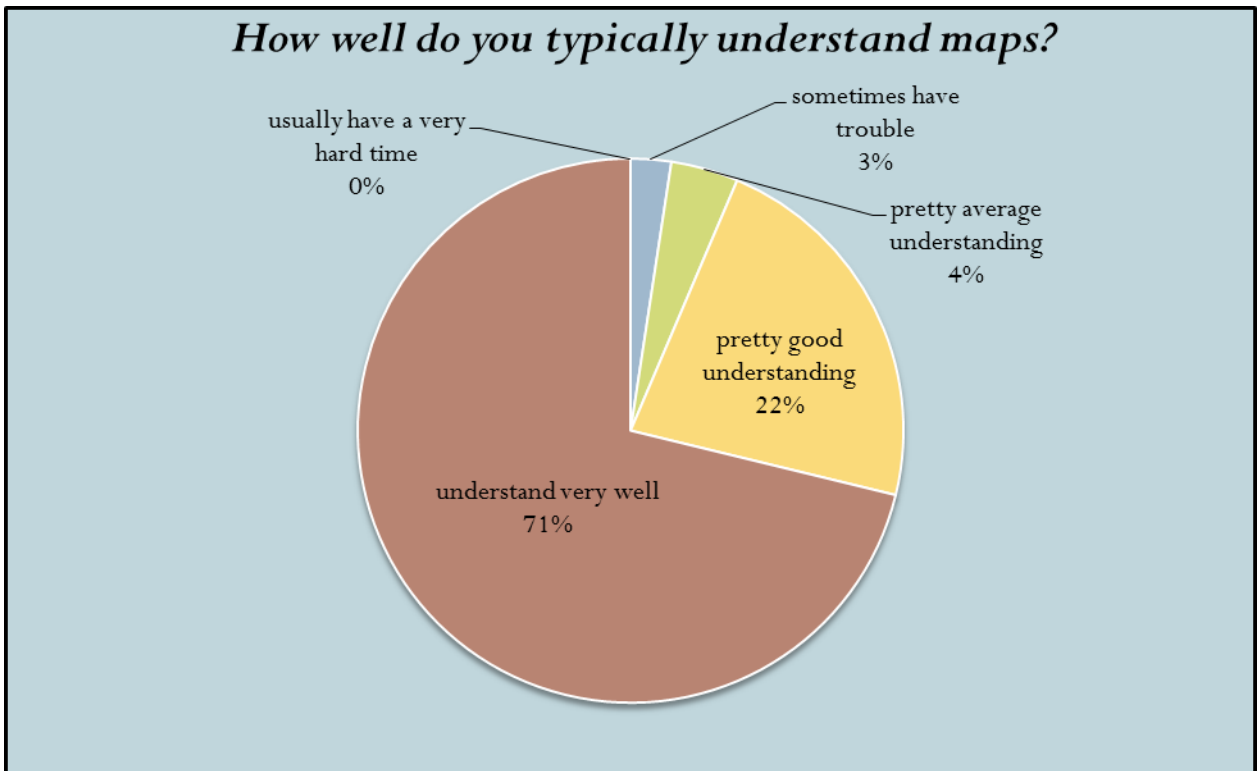


Figure 32: This pie chart shows the survey respondents' comprehension level of maps.

Select your favorite map based on your view for perspective. (See appendix 1 for images of the maps)

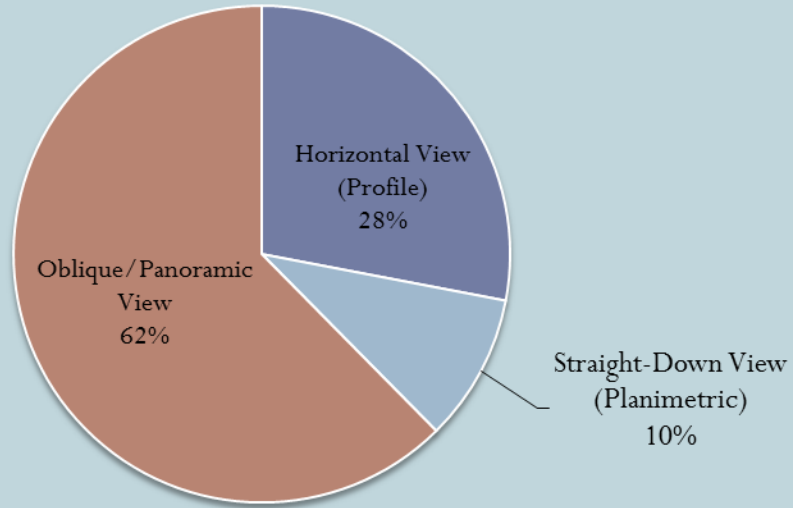


Figure 33: This pie chart shows the survey respondents' preferences for perspective. Most respondents stated that they preferred the oblique/panoramic view type.

Why is the map you selected your preferred perspective?

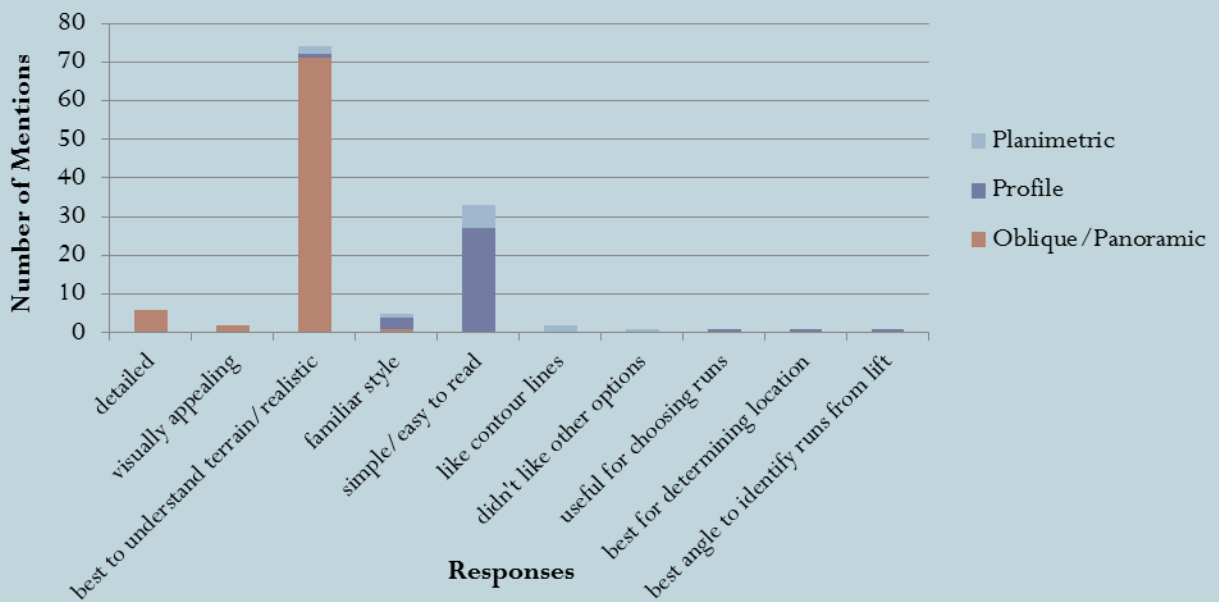


Figure 34: This bar graph shows the respondents' comments concerning their preferred view type. Respondents tended to like the oblique view type because it was the easiest to understanding the terrain and realistic. Respondents also often commented that they liked the profile view type because it was simple and easy to read.

Select your favorite image based on the overall appearance of the background landscape. (See appendix 1 for images of the maps)

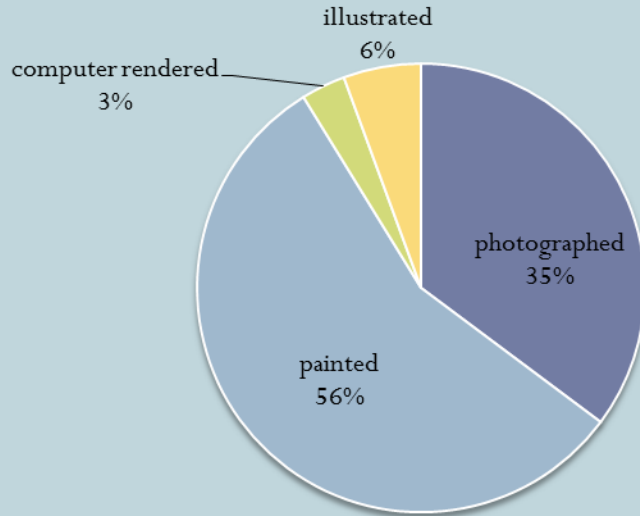


Figure 35: This pie chart shows the survey respondents' preferences for how the background image was created. The painted style was the most popular.

Why is the map you selected your preferred appearance of the background landscape?

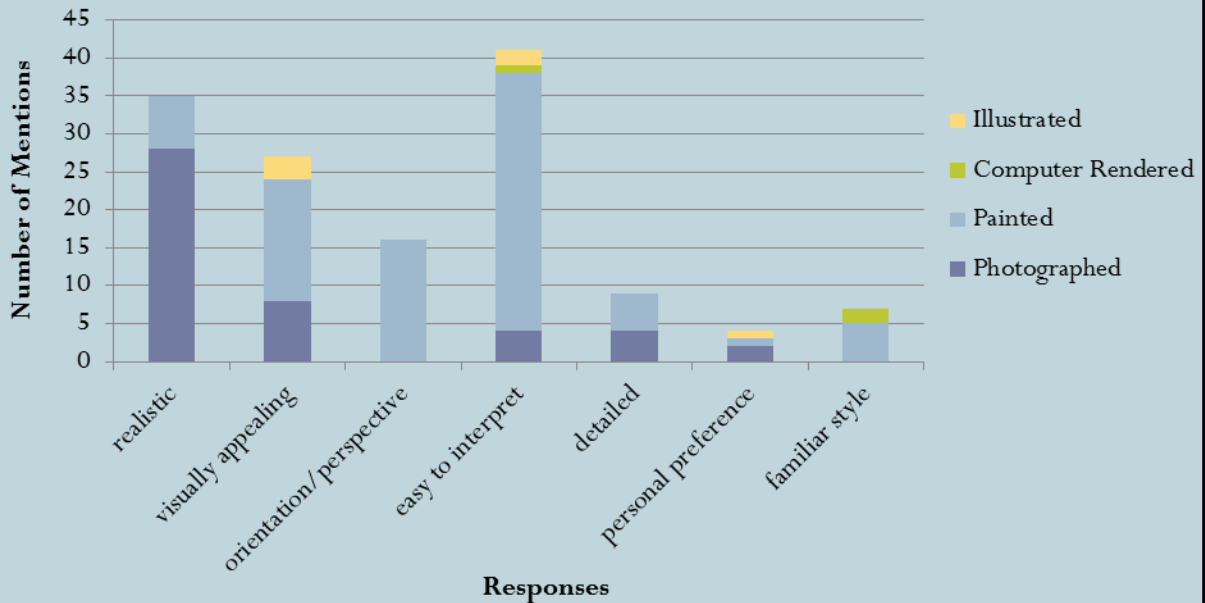


Figure 36: This bar graph shows the respondents' comments concerning their preferred creation style. Respondents who preferred the painted style often mentioned that it was easy to interpret, visually appealing, and good for orientation/perspective purposes. Many respondents also commented that they liked the realism of the photographed style.

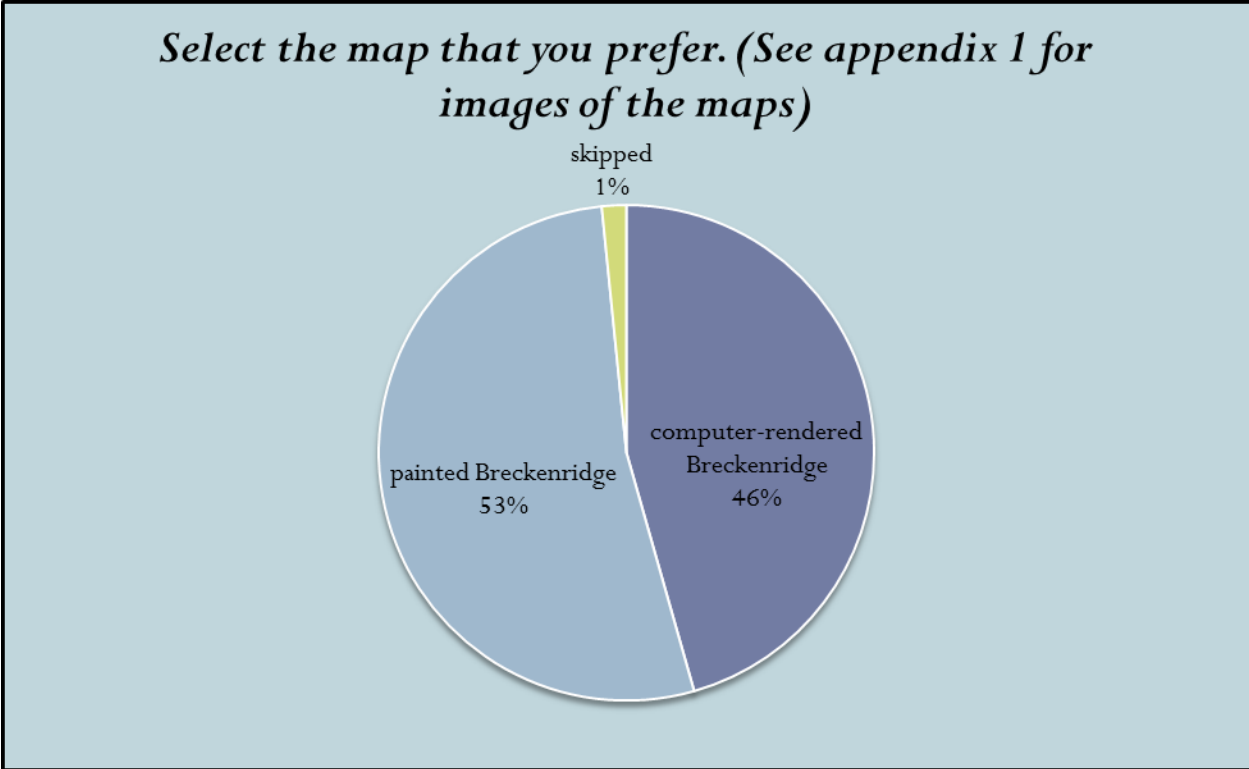


Figure 37: This pie chart shows the survey respondents' preferences for two versions of a map of Breckenridge Ski Resort in Colorado. The results are split pretty evenly between the two choices.

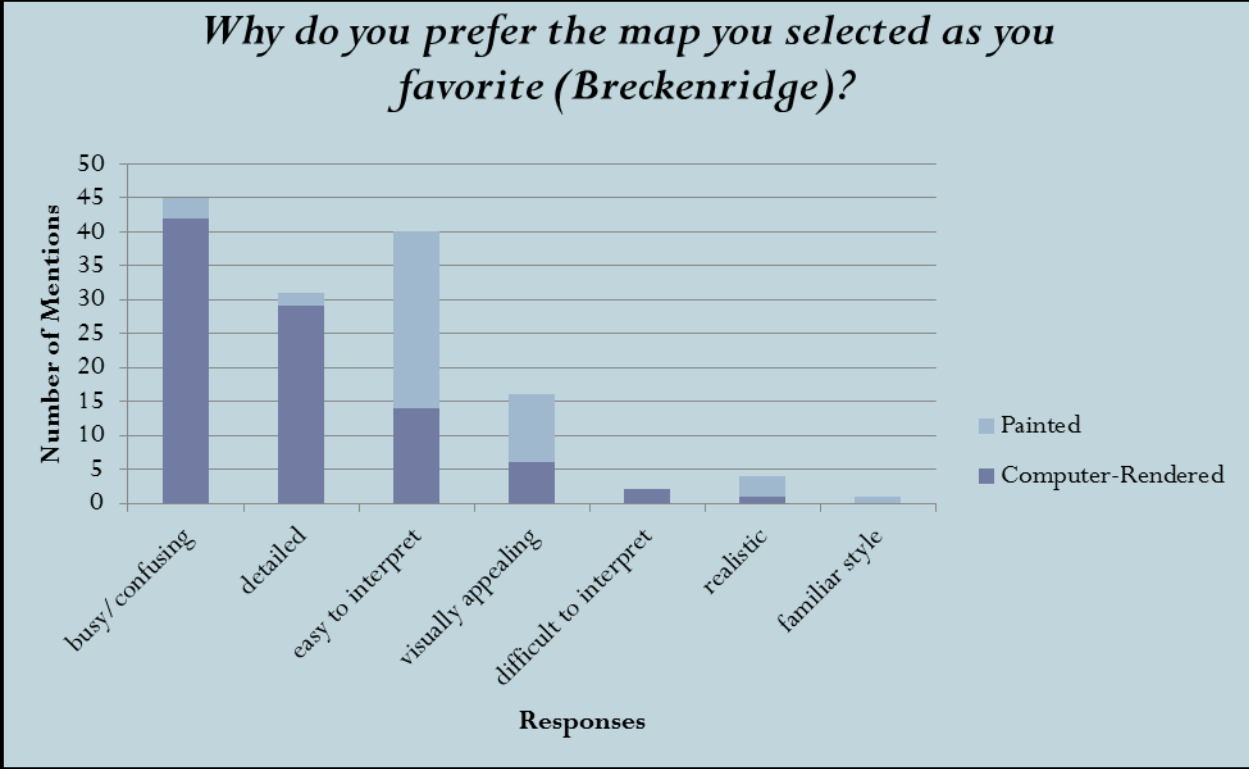


Figure 38: This bar graph shows the respondents' comments concerning the Breckenridge map style that they preferred. The computer-rendered style was often described as busy or confusing, but some respondents appreciated its detail. The painted style was most often described as easy to interpret and visually appealing.

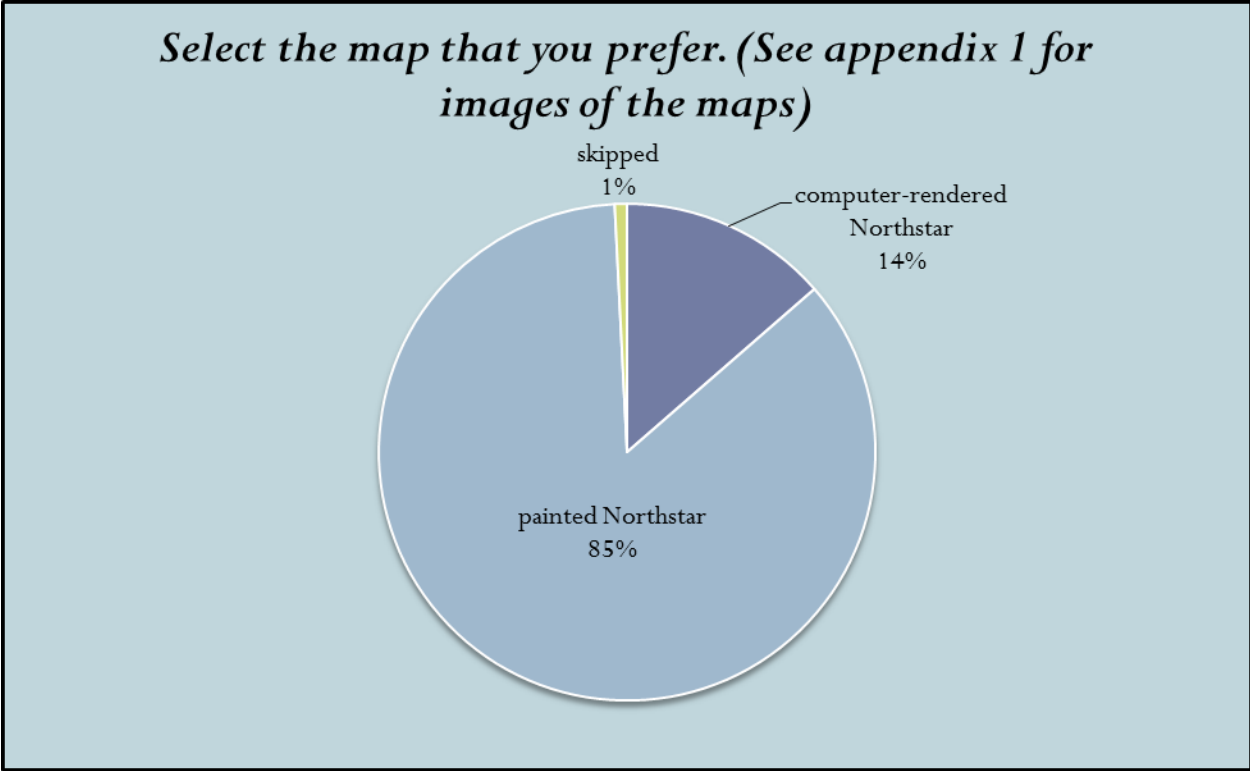


Figure 39: This pie chart shows the survey respondents' preferences for two versions of a map of Northstar in California. The majority of respondents(85%) preferred the painted style.

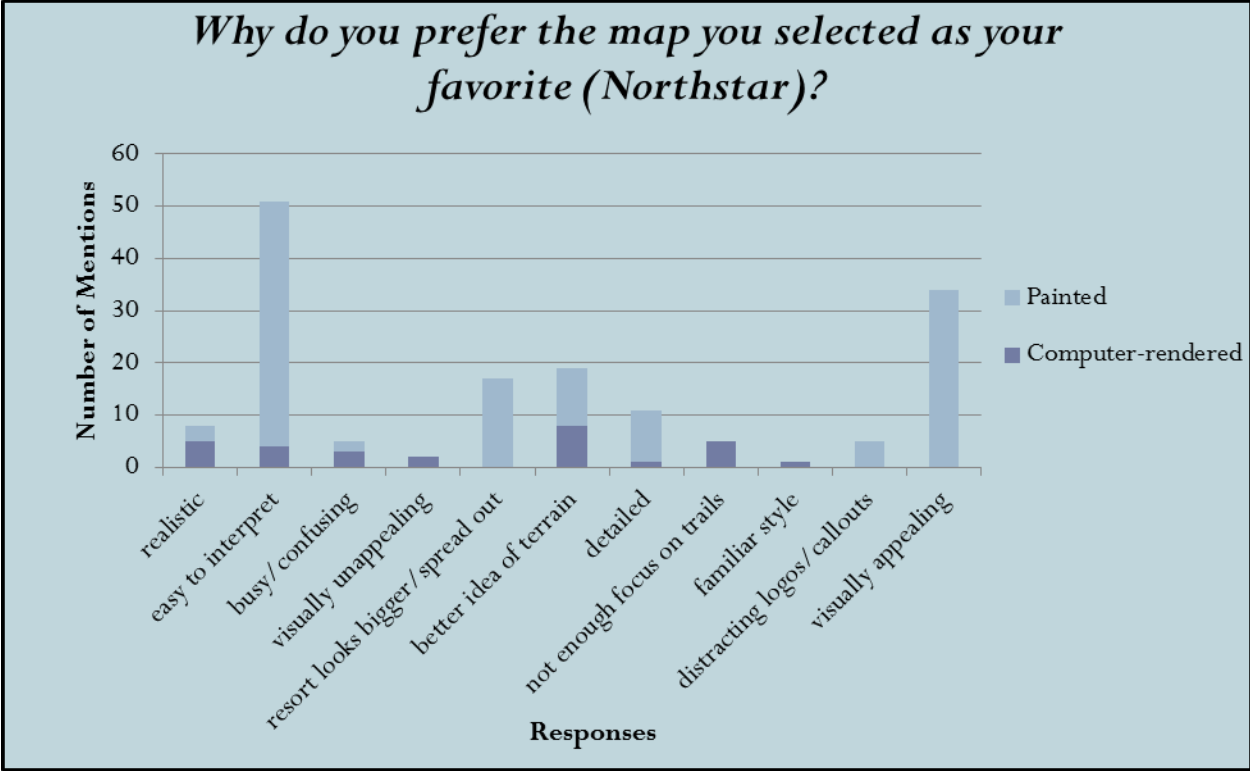


Figure 40: This bar graph shows the respondents' comments concerning the Northstar map style that they preferred. The painted style was most often described as easy to interpret and visually appealing. Some respondents thought that the computer-rendered style was realistic and gave a better idea of the terrain, but others mentioned that it was busy and confusing and did not focus enough on the trails.

Select the map that you prefer. (See appendix 1 for images of the maps)

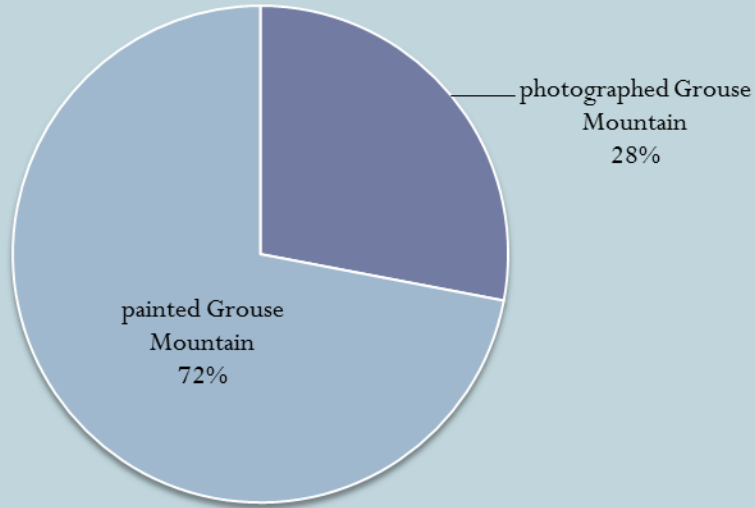


Figure 41: This pie chart shows the survey respondents' preferences for two versions of a map of Grouse Mountain in British Columbia. The majority of respondents (72%) preferred the painted style.

Why do you prefer the map you selected as your favorite (Grouse Mountain)?

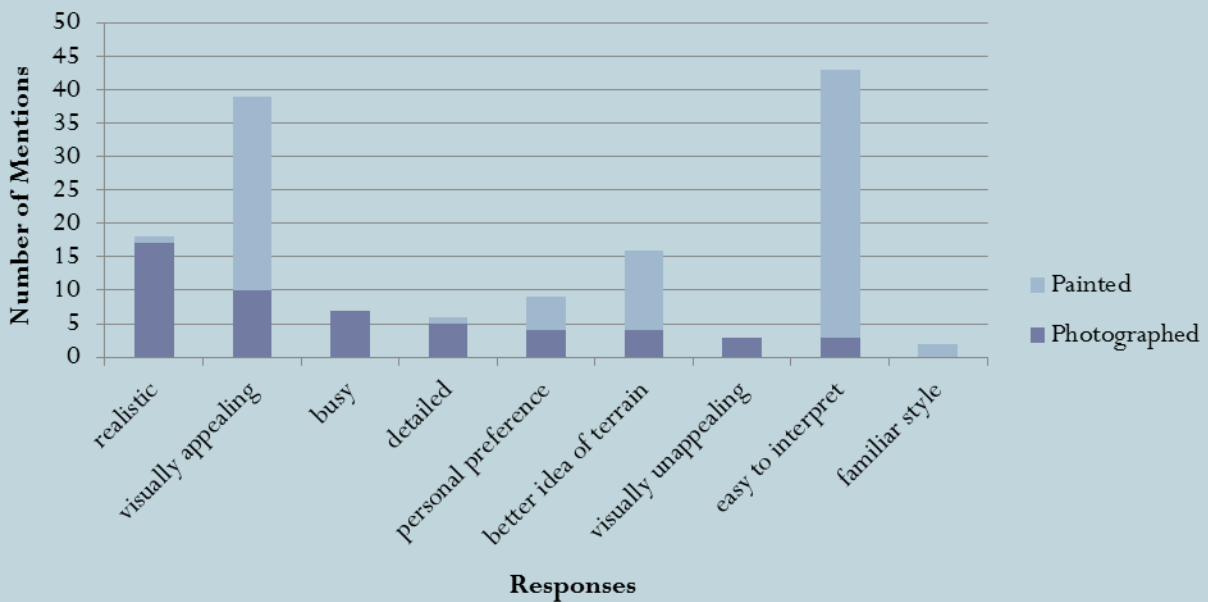


Figure 42: This bar graph shows the respondents' comments concerning the Grouse Mountain map style that they preferred. Many respondents commented that the painted style was visually appealing and easy to interpret. The photographed style was liked for its realism and visual appeal, but some respondents mentioned that it was overly busy. 45

Would you be interested in using augmented reality ski goggles at ski resorts?

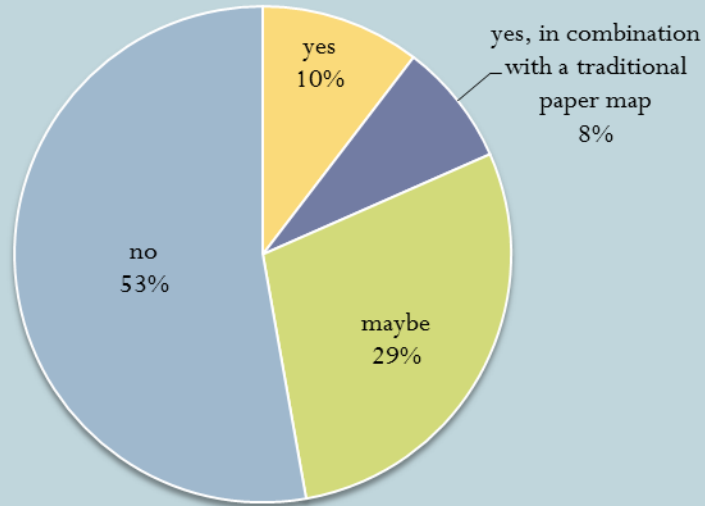


Figure 43: This pie chart shows the survey respondents' level of interest concerning augmented reality ski goggles. The majority of respondents were not interested.

What are your opinions / concerns about this special type of ski goggle?

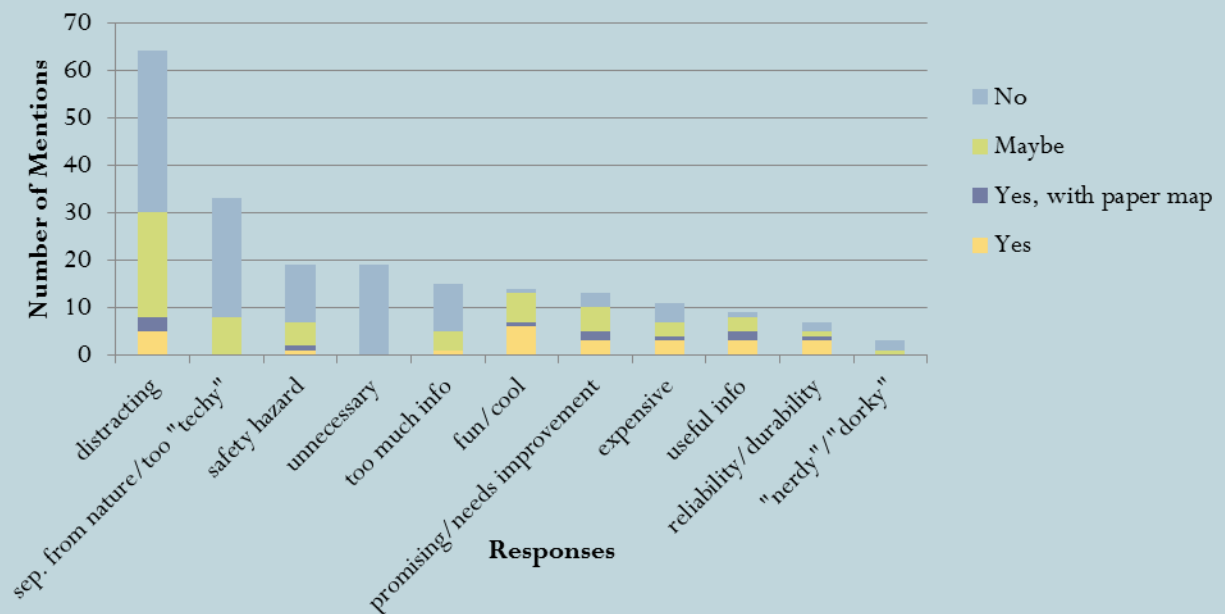


Figure 44: This bar graph shows the respondents' opinions and concerns regarding augmented ski map goggles. Regardless of how they answered the previous question, many respondents commented that the goggles would be distracting and a possible safety hazard. Respondents who were possibly interested or not interested in the goggles at all expressed concern that the excessive technology would create a separation from nature, and that the device is simply unnecessary.

If a GPS-enabled map was offered by a smartphone application at the resort of your choice, would you use it?

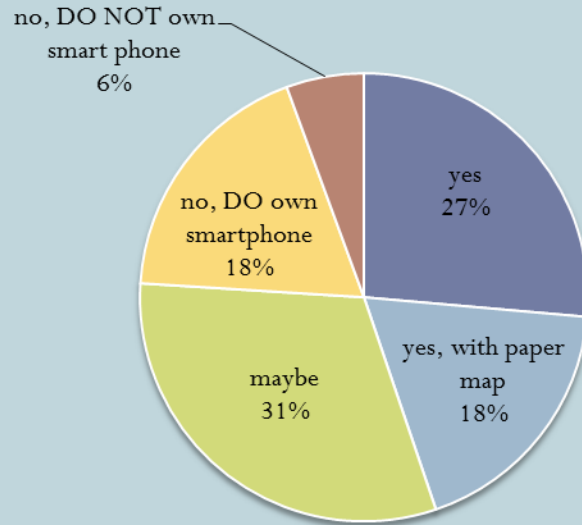


Figure 45: This pie chart shows the survey respondents' level of interest concerning GPS-enabled maps offered by smartphone applications. The results are mixed.

What are your opinions / concerns about smartphone ski resort trail map applications?

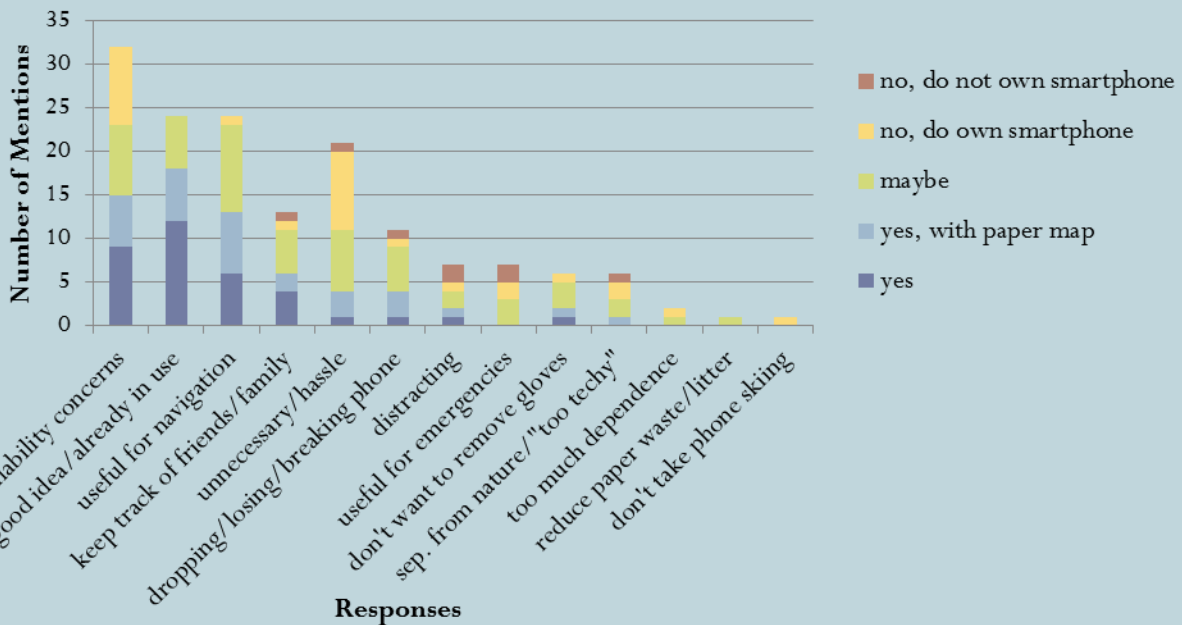


Figure 46: This bar graph shows the respondents' opinions and concerns regarding GPS-enabled trail maps offered by smartphone applications. The most common concerns were in regard to the reliability of the device/application and dropping/losing/breaking the device. Respondents who were more interested commented that they are a good idea or that they already use smartphone trail map applications, and that they are useful for navigation.

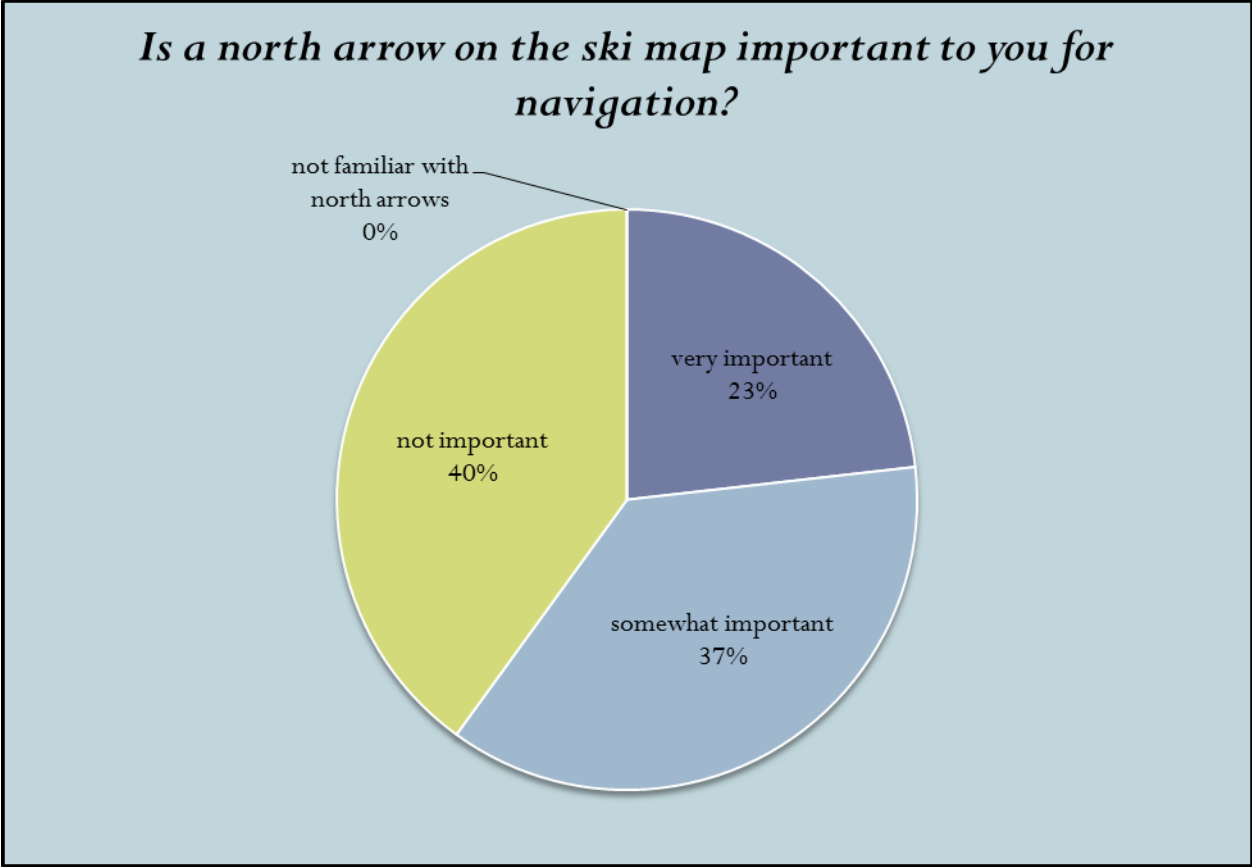


Figure 47: This pie chart shows how important a north arrow was to the survey respondents. 100% of respondents were familiar with north arrows, but the level of importance was divided fairly evenly.

7.4 The Ski Map Artists

Of the 1,779 trail maps that were compiled into a database for this thesis, 68% did not have any clear attributions to its creator. The remaining 32% of maps were accredited to 120+ distinct artists and cartographers, most of whom created maps for only one or two resorts. Only a handful of artists have produced ski maps for more than three resorts, prompting the business of ski mapping to be referred to as a “niche market.” Due to a limited number of clients, ski mapping can only be controlled by a few specialized artists at a time (Tait 2010). The purpose of the following few pages is to summarize, characterize, and honor the work of the most prominent and influential ski map artists over the last several decades.

7.4.1 Heinrich Berann

When Alex Tait surveyed ski maps in 2008, he found that painted panoramas (especially panoramas painted by hand) were the most common view type and creation method of modern ski maps in North America. The database created for this thesis reaffirmed this finding, and also found that hand-painted panoramas have been a popular style of ski map for many years. The inception of this style of ski map can be traced back to the early 1930s in Austria, where a young man named Heinrich Berann taught himself the art of painting. In 1934, Berann painted his first panorama of a newly opened mountain road in Austria and won first prize in a competition for his efforts. His unanticipated success in the competition convinced him to pursue panorama painting, subsequently initiating a long and prosperous career. From 1934 to 1994, Berann painted over 500 panoramas almost exclusively of mountainous areas (Figure 48). The majority of his panoramic maps illustrate majestic views of tourist



Figure 48: Berann's signature.

locations and ski areas in his native Alps, but he also painted scenes in Asia, Africa, and North America. Berann's work is known for his use of vivid colors, glistening lakes, and whimsical cloud formations (Figure 49). Although Berann only painted one map of a ski resort in North America (Squaw Valley, CA) his works went on to influence many American ski map artists after him. Today, Berann is widely recognized as "the most accomplished panoramist of all time" and as the "father of the modern panorama map" (Patterson 2000, 38; Troyer). Despite the fact that Berann did not actually invent the panorama (they have been around since the late 1700s, see page 5), it is generally recognized that he perfected the style (especially of mountainous terrain) and his work continues to serve as the inspirational standard today (Patterson 2000).



Figure 49: Jungfraubahn, Switzerland. Hand-painted by Heinrich Berann, 1947. Berann's work is known for his use of vivid colors, glistening lakes, and whimsical cloud formations. Accessed from www.berann.com on March 25, 2015.

7.4.2 Hal Shelton

The first notable ski map artist in North America was a California native named Hal Shelton, born in 1916. During his early career Shelton worked as a cartographer for the U.S. Geological Survey, and is known for his innovative ideas regarding natural color maps and contour shading (Patterson & Kelso 2004). By the early 1960s Shelton was an established cartographer living in Colorado at the epicenter of the ski resort construction frenzy. Shelton's professional training in cartography, user-friendly mapping techniques, and ideal location in Colorado provided him with the perfect credentials to create impressive maps for the new resorts (Masia 2005). Inspired by Berann, Shelton hand-painted panoramas for several world-class resorts including Bear Valley, Alta, and Mammoth (Figure 50). His paintings are characterized



Figure 50: Shelton's all-caps signature.

by a realistic color palette, thick brushstrokes for background features, and individually painted trees in the foreground (Figure 51). Shelton's work was well-received, and he dominated the ski mapping industry in the western United States for much of the 1960s and 70s (Tait 2010).



Figure 51: Mammoth Mountain, California. Hand-painted by Hal Shelton, 1976. Pictured here as seen in the 1982 trail map. Shelton's maps are characterized by a realistic color palette, thick brushstrokes for background features, and individually painted trees. Accessed from skimap.org on March 27, 2015.

7.4.3 Donald Moss

Donald (Don) Moss, a contemporary of Shelton, was introduced to the business of ski resort mapping in New England. Moss learned to paint at a young age, and established his early career producing illustrations for magazines (Masia 2005). In the 1960s and into the early 90s, he was asked to paint several maps for resorts in the Northeast United States, including Smuggler's Notch, Bromley, and Okemo (Figure 52). Moss's maps are recognized by the more gentle terrain typical of New England, soft pastel colors, and frosted tree appearance (Figure 53).



Figure 52: Don Moss's signature. It appears that his name may have been added by a computer after the painting was completed.



Figure 53: Okemo Mountain, Vermont. Hand-painted by Donald Moss, 1989. Moss's work is recognized by the more gentle terrain typical of New England, soft pastel colors, and a frosted tree appearance. Accessed from skimap.org on March 27, 2015.

7.4.4 Bill Brown

As the 1970s came to a close, Hal Shelton began to pursue other career interests in fine art. This shift in Shelton's career provided the circumstances for a new ski map artist to emerge into the business, and Bill Brown took the opportunity (Patterson & Kelso 2004). Little is known about Brown's personal life, other than he also lived in Colorado (Tait 2010). Brown monopolized the ski mapping industry for much of the late 70s and 80s, hand-painting panoramas for dozens of resorts across the United States (Figure 54). During his career, he produced maps for at least 15 resorts in Colorado alone, including many major resorts such as

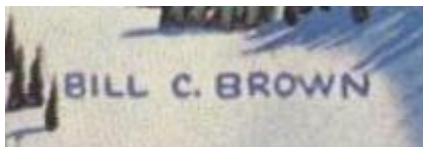


Figure 54: Brown's simple all-caps signature can usually be seen along the bottom of his paintings, neatly blended into the natural landscape.

7.4.5 Murray Hay

Murray Hay entered into the ski map industry in the early 1980s, hand-painting maps for over a dozen large resorts (Figure 56). Very little is known about Hay's personal life, except that he lived and worked out of Alberta, Canada (Tait 2010). It is difficult to describe exactly what differentiates Hay's style from his colleagues, particularly that of Shelton and Brown (Figure 57).



Figure 56: Although Hay experimented with different signatures, this serif title case style is the most commonly seen.

Perhaps the only giveaway that you are viewing a map created by Murray Hay is the actual physical location of the resort. According to the database created for this thesis, Hay painted maps almost exclusively for resorts located British Columbia and Alberta. Only three trail maps (Alyeska, Alaska, Mont Sainte Anne, Quebec, and Silver Mountain, Idaho) are not located in British Columbia or Alberta.



Figure 57: Mount Norquay, Alberta. Hand-painted by Murray Hay, 1990. Hay's maps are almost exclusively of resorts in British Columbia or Alberta. Accessed from skimap.org on March 31, 2015.

7.4.6 Terragraphics

Terragraphics, run by Peter Powers, has produced digitally painted ski maps for several resorts in North America since the mid-1990s (Figure 58). The maps are created using a raster based computer program (such as Adobe Photoshop) to



Figure 58: Terragraphics' signature.

achieve a look that is reminiscent of the hand-painted style. The final results are well crafted and aesthetically pleasing, yet feel slightly inorganic compared to their hand-painted counterparts (Figure 59). On some maps it is obvious that the same couple trees are duplicated throughout the forest. This technique lowers production time and expense, at the cost of natural variation within the vegetation.



Figure 59: Berkshire East, Massachusetts. Digitally-painted by Peter Powers of Terragraphics, 1995. Pictured here as seen in the 2011 trail map. Terragraphics attempts to reproduce the traditional hand-painted style using digital techniques. Accessed from skimap.org on April 1, 2015.

7.4.7 VistaMap

VistaMap is operated in the Greater New York City Area by Gary Milliken. Since 1993, Milliken has produced custom digital trail map illustrations for many major ski resorts, including

Vail, Alpine, and Steamboat (Figure 60). Milliken’s artwork is unique in that the features are entirely vector-based, except for some shading on the snow itself. The result is a clean depiction of the mountain consisting of crisp lines and vividly colored polygons (Figure 61). The vector style of Milliken’s artwork is especially apparent in the background, where the mountains are highly stylized.



Figure 60: Maps by VistaMap always include the date next to the identification.



Figure 61: Homewood, California. Digitally-illustrated by Gary Milliken of VistaMap, 2008. Milliken uses vivid colors and crisp lines to create a clean image of the mountain resort. Accessed from skimap.org on April 1, 2015.

7.4.8 Kevin Mastin

Kevin Mastin, owner of Stray Horse Arts Inc., entered the ski map business as a panorama painter in 2006 (Mastin 2015).

Working out of Silverthorne, Colorado, Mastin has hand-painted maps for several large resorts such as Keystone, Breckenridge, and Bear Valley (Figure 62). Mastin’s work is set apart from his



Figure 62: Mastin’s simple all cap signature uses initials for his first and middle names.

colleagues by his use of thick brushstrokes and mostly blue-ish hues (Figure 63).



Figure 63: Bear Valley, California. Hand-painted by Kevin Mastin, 2010. Mastin’s unique style is recognized by thick brushstrokes and mostly blue-ish hues. Accessed from skimap.org on April 1, 2015.

7.4.9 James Niehues

James Niehues learned to paint in ninth grade while living in Loma, Colorado (Weyland 2004). His early career was spent working several different jobs before he finally decided to pursue painting as a viable profession at age 40. Niehues had always admired the work of Bill Brown, and decided to contact him with the prospect of overflow jobs. Coincidentally, Brown's professional interests were shifting from resort painting to video production, and in 1988 he offered Niehues his first trail mapping job of Mary Jane Mountain at Winter Park Resort in Colorado (Bivouac Media 2014). Niehues continued to accept jobs originally meant for Brown, and eventually began obtaining trail map jobs of his own. Since 1988, James Niehues has hand-painted maps for ski resorts all over the world, in addition to regional panoramic views of towns, golf courses, and summer resorts. He is the current ruler of the ski mapping industry; in 2008 112 North American ski resorts and 57 of the top 100 resorts used his maps (Tait 2010). Figure 64 was created to provide a visual of just how prominent Niehues is in the ski mapping world. The map highlights every ski resort in North America that Niehues has painted at least one scene for, an incredible 144 resorts, roughly a quarter of all resorts in North America. His maps have become so inescapable that they have been taken for granted as the norm. An article written in 2014 explains, "His works are so familiar that when you stumble upon a trail map that's not by him, it's almost disorienting. [The author's sister] once declared, 'This trail map isn't by James Niehues, so I have no idea where I am'" (Bivouac Media 2014).

Niehues' success in the ski mapping business is well deserved. Crediting Berann, Shelton, Brown, and Hay as his greatest artistic influences, Niehues' panoramas pay homage to his predecessors' traditional hand-painted style while adding his own personal flair (Niehues 2015). A typical ski map by Niehues features the mountain freshly powdered with a blanket of



Figure 64: All the resorts in North America that James Niehues has painted at least one scene for, a total of 144. Created by Amy Lippus.

snow, each individual tree meticulously detailed and precisely placed, and vivid colors that attract the eye and lend energy to the scene (Figure 65). In 1997 Niehues began tinting the sky pink with alpenglow, which has become a distinctive trait seen in many of his maps.

Niehues begins the mapmaking process by examining aerial photographs of the resort at various altitudes and angles. He then uses an airbrush to depict the sky and snow, critical for making the mountain appear blanketed in soft powder. The rest of the image is completed using a paintbrush and gouache (an opaque watercolor), which makes future changes to the trails easier (Weyland 2004). Although recently semi-retired, Niehues is still actively painting ski maps today.



Figure 65: Whitefish, Montana. Hand-painted by James Niehues, 1997. Pictured here as seen in the 2001 trail map. A typical ski resort painting by James Niehues. Accessed from skimap.org on April 2, 2015.

8. DISCUSSION

The purpose of this section is to consolidate information acquired from the ski map database, quantitative survey, key-informant interviews, and literature into a cohesive analysis of the history and evolution of ski map style and design.

8.1 View Type

The panoramic view type is the most common view type seen in North American ski maps for the past several decades, and is the favorite view type among 62% of survey respondents. As explained in the literature (Haeberling 2005, Petrovič & Mašera 2006, Schobesberger & Patterson 2008, Dorling & Fairbairn 2013), the panoramic view type tends to be easier to interpret than other view types by mimicking how the resort would actually be seen from an airplane window. Appropriately, many survey respondents commented that the panoramic view type was their preferred perspective because it was easy to interpret the terrain and appeared realistic. Even though many panoramic views are slightly distorted, the average map user doesn't seem to know or care as long as he/she can quickly and easily understand the topography of the resort.

The profile view type is the second most common view type seen in North American ski maps and the second most popular favorite among survey respondents. Profile maps are generally quicker, easier, and cheaper to produce than panoramic maps due to the lack of shading and depth. These attributes make the profile view type appealing for many smaller resorts with limited budgets, but also appeal to certain users. 28% of survey respondents preferred the profile view, mostly commenting that it was simple and easy to read. Profile maps may be considered easy to read by some skiers because the connectivity of trails is easily perceived in a flat, 2D manner.

The planimetric view type is very rarely seen in North American ski maps and is the least popular view type among survey respondents. Respondents that did prefer the planimetric view type mentioned that it was simple and easy to read and that they liked the contour lines. Infrequent use of the planimetric view type is most likely attributed to the nature of alpine skiing. Although the planimetric view type best preserves cardinal direction, determining north from south is not typically important to a skier. The route most relevant to an alpine skier is down, which is best visualized with a panoramic or profile view. Interestingly, the planimetric view type is more universally seen in cross-country ski maps when cardinal direction is more relevant (Tait 2010). Also, most map viewers cannot quickly visualize the natural valleys, peaks, and ridgelines of a complex mountain landscape with a planimetric map. Contour lines and/or hillshading techniques can be effective at simulating some depth and steepness, but the results simply do not compare to the impressive terrain representation featured in panoramic maps.

8.2 Creation Method

The majority of ski resort maps in North America are painted, mostly by hand (Figure 66). Painted maps were also the most commonly preferred creation method among survey respondents, for several reasons. When asked why the painted style was their preferred creation method, many respondents commented that the map was easy to interpret and visually appealing. It was also mentioned that the painted style was helpful with orientation and perspective, although this is probably more attributed to the view type used in the map (panoramic). Less often, respondents mentioned that the painted style was preferred because



Figure 66: A close-up view of the brushstrokes painted by Kevin Mastin on his 2014 map of Suicide Six in Vermont.

it was realistic, detailed, and a familiar style. The map used for this particular question in the survey was painted by James Niehues, which is probably why some respondents mentioned it was a familiar style. As an unrelated detail, several survey respondents noted it was nice to see the surrounding peaks labeled on the map.

The second most common preferred creation method of survey respondents was the photographed style, although it was the third most common creation style seen in the database. Not surprisingly, respondents who preferred the photographed map mentioned most often that they liked the map's realism. Respondents also enjoyed the map for its visual appeal, level of detail, and ease of interpretation.

Although not a very commonly seen creation method overall, the photographed style has consistently made up small portion of North American ski maps for several decades. Photographed maps are especially appealing to smaller resorts, as they are probably one of the cheapest styles of ski map to produce. They also provide a level of realism unmatched by any other creation method, making the photographed ski map ideal for the most meticulous users. Especially for advanced skiers and snowboarders who wish to go off trail, the exact position and density of trees can be very beneficial.

In the early days of ski mapping in North America, illustrated maps were drawn by hand using ink or sometimes pencil. They were rarely full color, generally consisting only of black or a couple colors of ink. Several early illustrated ski maps showcased the resort using a vintage and almost cartoony approach, as seen in figures 67 and 68. This classic style of illustrated ski map was used from the 40s until the 70s.

The illustrated style of ski map began to change as soon as the first computers became fairly accessible. Starting in the late 1960s, ski maps that appear to be at least partially produced

by a computer began to penetrate the business. These early computer maps tended to be very basic black and white profile views of the resort (Figure 69). As technology advanced, the



Figure 67: Cannon Mountain, New Hampshire. Artist unknown, 1943. This map is an example of the early hand-illustrated creation method. Accessed from skimap.org on April 24, 2015.

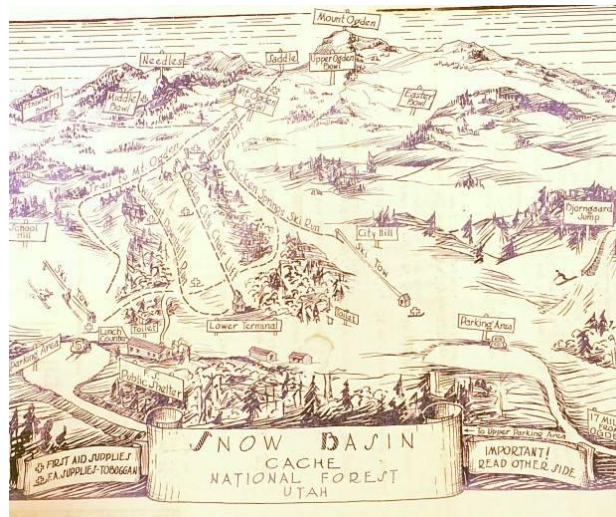


Figure 68: Snow Basin, Utah. Artist unknown, 1950. This map is an example of the early hand-illustrated creation method. Accessed from skimap.org on April 24, 2015.

overall design quality of computer illustrated ski maps also advanced. Today, many computer-illustrated ski maps are a far cry from their hand-illustrated predecessors (Figure 70).

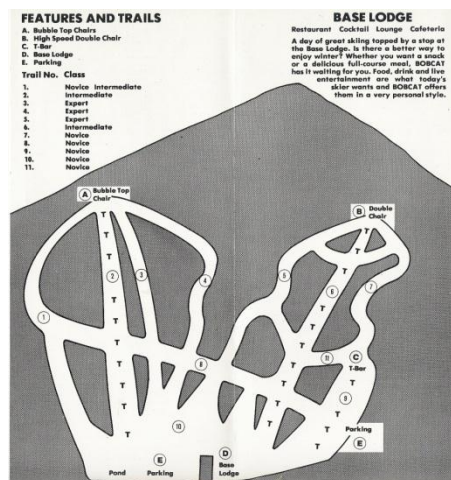


Figure 69: Crotched, New Hampshire. Artist unknown, 1971. This map is an example of one of the earliest ski maps that appears to be created using a computer. Accessed from skimap.org on April 24, 2015.



Figure 70: Big Sky, Montana. By Rad Smith, 2013. This map is an example of an attractive modern-day computer-illustrated map. Accessed from skimap.org on April 24, 2015.

Simplified and somewhat cartoony computer-illustrated maps are also often seen for smaller resorts (Figure 71).



Figure 71: Buck Hill, Minnesota. Artist unknown, 2004. This map is an example of a smaller and cartoony modern-day computer -illustrated map. Accessed from skimap.org 2015.

Illustrated maps (by hand or computer) were the second most common creation method seen in the maps collected for the database, and the third most common favorite creation method among survey respondents. A computer-illustrated map from 2009 (by VistaMap) was used as the example of the illustrated style in the survey, to make the results more relevant for determining modern ski map preferences. Respondents who preferred the illustrated style commented that the map was visually appealing and easy to interpret. These comments are likely connected to VistaMap's use of clean lines, vivid colors, and oblique view.

The computer-rendered creation method was not adopted by the ski mapping industry until the late 1980s. One of the first computer-rendered maps that I came across while creating the database for this thesis was of Kirkwood Resort in California from 1987 (Figure 72). The terrain itself is gray with a white grid laid over it to represent the topography. The map shows no vegetation and features a red sky that fades into black. This particular ski map is so unlike any

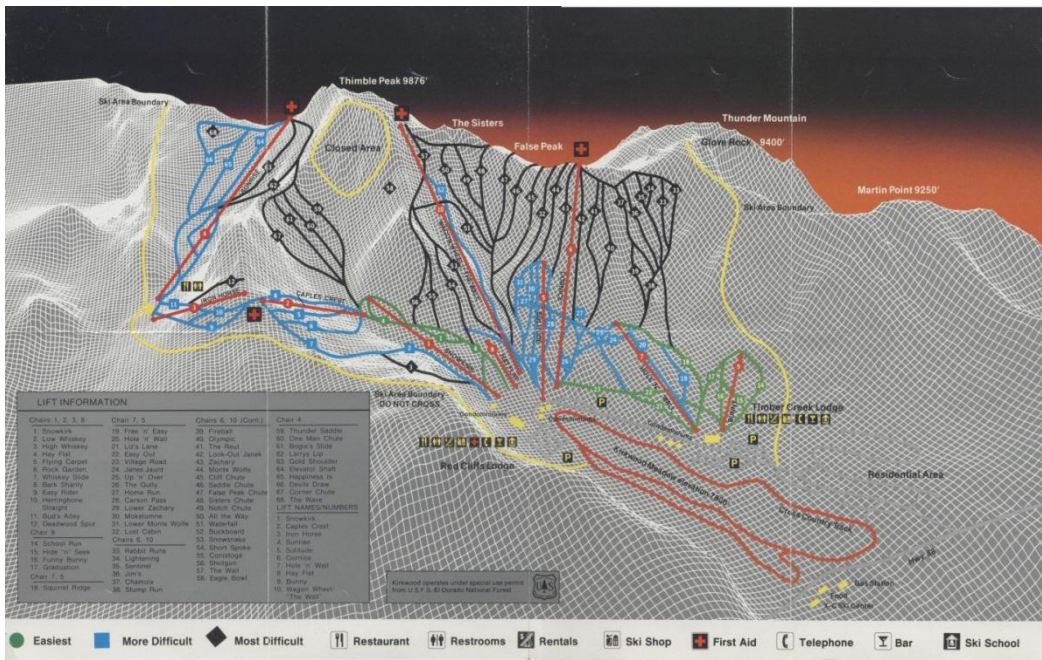


Figure 72: Kirkwood, California. 1987. Artist unknown. This map displays a unique computer-rendered style that did not catch on. Accessed from skimap.org on April 24, 2015.

other ski maps collected for the database that one can't help but ponder the motivation behind the design. I believe that this map was an experiment by Kirkwood to test state-of-the-art digital-rendering technology to get a futuristic look with the goal of appearing ultra-modern to a younger crowd. This style did not catch on, and a couple years later Kirkwood replaced the digitally-rendered map with a much more traditional hand-painted map by James Niehues. It is possible that this replacement happened because Kirkwood skiers were unhappy with the digitally-rendered version, and instead preferred the more traditional hand-painted style that had been associated with upscale resorts for many years.

More recently, some resorts have begun to use satellite imagery draped over a digital elevation model (DEM) to digitally render the vegetation and topography of the mountain. One of the survey questions asked respondents to compare two maps of Breckenridge in Colorado: one that utilized the aerial imagery and DEM technique, and a more traditional hand-painted version by Bill Brown. Although the overall preference results were split pretty evenly, the

computer-rendered version was often described as “busy” or “confusing,” although some respondents appreciated its level of detail. Concerning this particular map, Alex Tait critiqued; “It’s accurate but it’s not as informative. People confuse accuracy with effective information transfer” (Tait 2015).

8.3 North Arrows

North arrows were once considered to be a “cartographic convention” and were mandatory on all maps. Recently, some cartographers have challenged this convention by not including a north arrow when it is deemed unnecessary, unhelpful, or incorrect (Buckley 2007). Many ski map designers must have possessed these sentiments, as the vast majority of ski resort maps collected for the database did not include a north arrow. North arrows are only technically accurate when the planimetric view type (the least common view type) is used, which partially explains why north arrows are rarely seen on ski maps. On ski maps that use the other two view types (oblique and horizontal), north arrows are often unreliable. In order for a multi-faced resort to be mapped on a flat surface from any angle other than from directly above, terrain distortions are necessary to view hidden valleys and ridges. The prominent ski map artist, James Niehues, explains that these distortions cause cardinal directions to be inconsistent throughout the illustration (Niehues 2015). Another possible explanation for the infrequency of north arrows on ski maps is because determining north from south might be considered irrelevant to many skiers. As explained earlier, the most important direction to a skier is usually down, toward the bottom of a ski lift. Knowing which direction is north or south is unimportant when all the trails eventually lead to the same place.

Considering the points mentioned above, including a north arrow on most ski maps seems to be fairly useless and possibly misleading. However, a total of 60% of survey respondents

stated that a north arrow on a ski map is at least *somewhat important* to them for navigation, 23% of which stated that it is *very important* to them. These percentages are higher than anticipated, especially because so few ski maps actually have north arrows on them. The survey respondents were not asked to comment about their opinions of north arrows on ski maps, but I speculate that skiers use the north arrows for several different reasons. North arrows can help new visitors to get their bearings in an unfamiliar setting, or help to identify features when sightseeing from the top of the mountain. Additionally, skiers may use north arrows to find north-facing slopes that have better quality snow. Finally, some map designers may add north arrows to add some artistic flair or to simply to fill blank space (Figure 73).

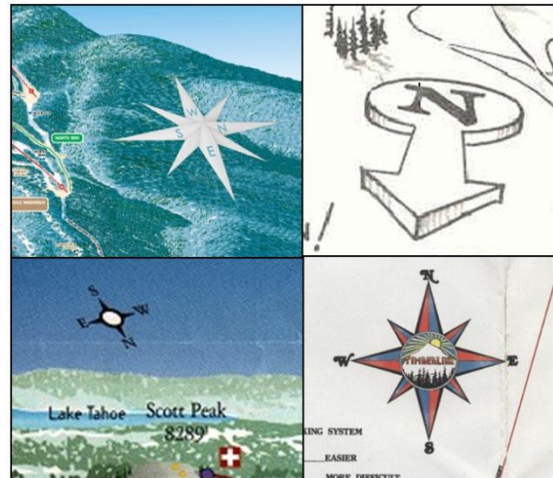


Figure 73: Examples of north arrows seen in the ski map database. Clockwise from top left: large and prominent (Gore, NY 2013), cartoony or unique (Bear Valley, CA 1970), stylistic and eye-catching (Timberline 1982), small and simple (Alpine 1997).

8.4 Color

The earliest full color map to be catalogued into the database was of Mad River Glen, Vermont in 1959 (Figure 74). Prior to this time, and for many years after, many of the trail maps collected from skimap.org were black and white, grayscale, or only used limited color. This does not, however, necessarily indicate that these maps were not initially created using color ink, paint, or film. Many of the maps, especially ones classified as grayscale, were originally created in full color and later converted to a desaturated version presumably to reduce the cost of reproduction (Figure 75).

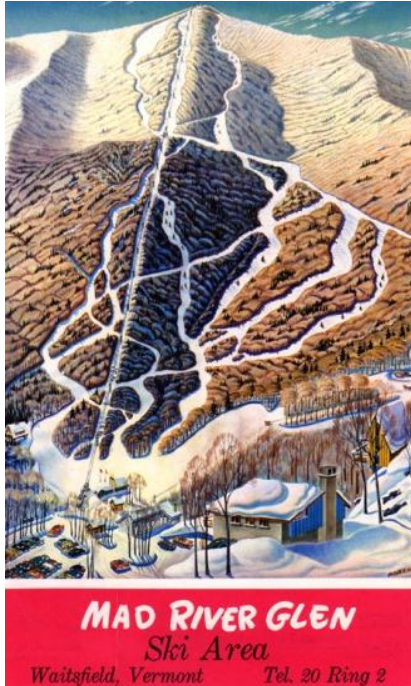


Figure 74: Mad River Glen, Vermont. Artist unknown, 1959. This is the earliest full color map to be catalogued into the database. Accessed from skimap.org on April 24, 2015.



Figure 75: Smuggler's Notch, Vermont. By Don Moss, 1965. This map was originally painted in full color but was converted to grayscale presumably to lower the cost of reproduction. Accessed from skimap.org on April 16, 2015.

As time went on, the addition of color on ski maps became more common. During the 60s and 70s many new resorts opened for business across North America, intensifying competition between resorts. Resorts that could afford the cost included bright, but limited color on their maps, probably to attract the eye of potential customers (Figure 76).

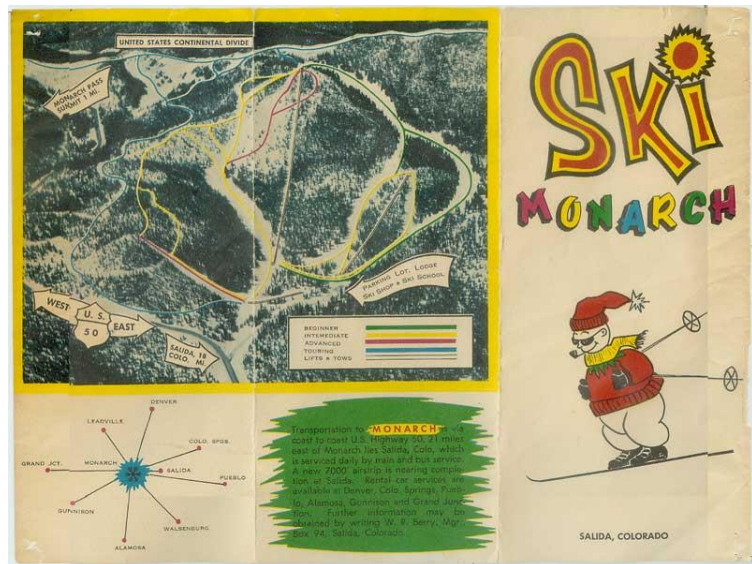


Figure 76: Monarch, Colorado. Artist unknown, 1963. This map shows the terrain and vegetation in grayscale, but is overlaid with a selection of bright colors to attract the eye of potential customers. Accessed from skimap.org on April 24, 2015.

Today, all but some of the smallest ski resorts produce full color trail maps. However, it was made apparent through the cataloguing process that the levels of saturation and contrast are sometimes different from season to season of the same exact trail map (Figure 77). It is difficult though to determine whether these variations in color are a product of how the resort originally printed the image, or the quality of the image posted on skimap.org. For example, the 1997 version of the map seen in Figure 77 could have been desaturated by the resort based on reasons of preference or printing costs, or it could have been poorly scanned by the user who uploaded it to the internet. Since it is impossible to know, little emphasis is placed on subtle color variations.

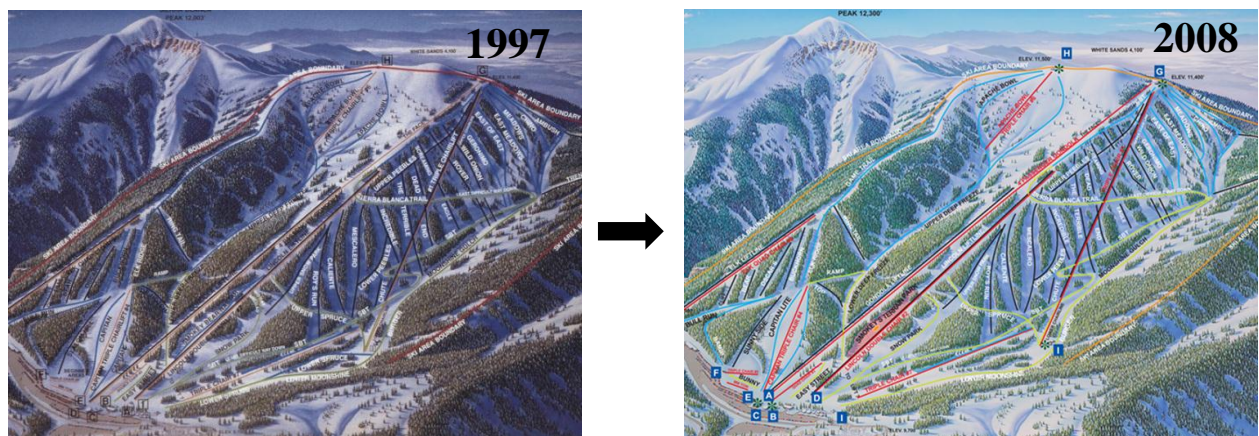


Figure 77: Apache, New Mexico. By James Niehues, 1997 and 2008. These maps show the differences in color between the same exact map in use by the same resort for different seasons.

8.5 Sky and Clouds

The sky on a typical ski resort map (when visible) tends to make up no more than a quarter of the image, yet it has the ability to literally and figuratively set the atmosphere for the entire scene. Sunny and clear blue skies tend to look the most inviting, and are favored by many ski resorts. However, lots of fresh snow also looks inviting to skiers, and snow obviously comes from clouds. Regarding the lack of clouds in many of his paintings, James Niehues jokingly comments “All that snow that’s there, boy I don’t know how it gets there because it’s all sunny

skies” (Niehues 2015). However, Niehues and other artists will sometimes add a couple clouds here and there as “a little reminder that snow comes from something” (Niehues 2015).

The addition of some clouds may also act as a warning that weather can change quickly in mountainous terrain, and to be prepared for any sudden changes. On some ski maps, the artist’s decision to add clouds may simply be for artistic purposes, such as to balance the composition or to add some texture to an otherwise uneventful sky. Very few resorts displayed clouds that were categorized as “large and prominent,” and most that did were prior to 1980. Although described as “large and prominent,” many

maps that fell into this category featured clouds that did not necessarily appear intimidating, but were actually puffy cumulus clouds typical of a pleasant summer day (Figure 78). Only two maps in the entire database featured clouds that could be considered “intimidating.”

The first is one of the oldest maps

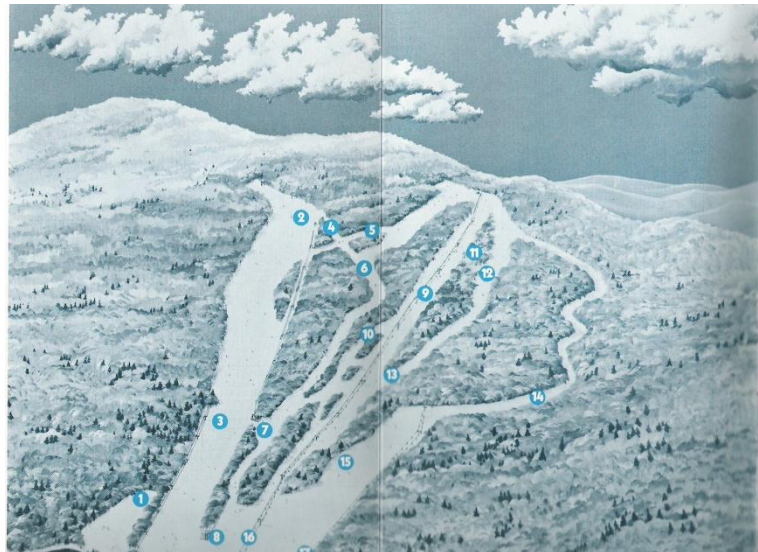


Figure 78: Mt. Tom, Massachusetts. Artist unknown, 1978. Puffy cumulus clouds categorized as “large and prominent.” Accessed from skimap.org on April 16, 2015.

collected for the database; a map of Bousquet Ski Area from 1936 (Figure 79). This map exhibits what appear to be large cumulonimbus clouds, which are usually associated with thunderstorms and severe weather. Although thunderstorms are rare during cold weather, this type of cloud does not make the resort appear very welcoming. Ski resort marketers probably figured this out, which may explain why storm clouds haven’t been seen on ski maps since.

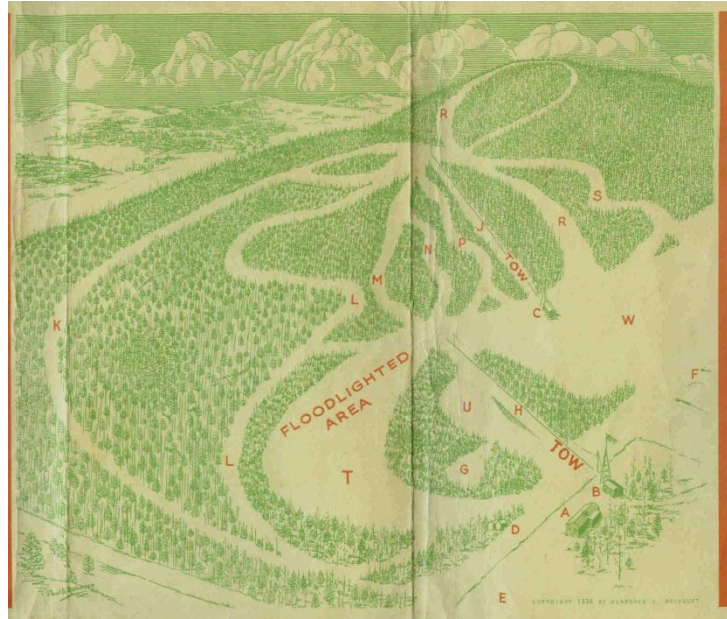


Figure 79: Bousquet, Massachusetts. By Paul Robinson, 1936. Cumulonimbus clouds associated with thunderstorms on the horizon. Accessed from skimap.org on April 16, 2015.

The clouds in the second map appear threatening in a very different way than the clouds seen at Bousquet. The 1970 (possibly photographed) map of Geneva Basin is one of the only maps to show the resort on an overcast day, with low-level clouds that make snow seem imminent (Figure 80). The result is a scene that looks cold and uninviting, and the lack of color only adds to its dreariness.



Figure 80: Geneva Basin, Colorado. Artist unknown, 1970. Low-level cloud cover and a lack of color make this map appear cold and uninviting. Accessed from skimap.org on April 18, 2015.

Despite snow being the driving force behind the existence of skiing, only four maps in the database depicted the resort while it was actually snowing, most likely for the reasons described above. Interestingly, three out of the four are of small resorts in Quebec that feature

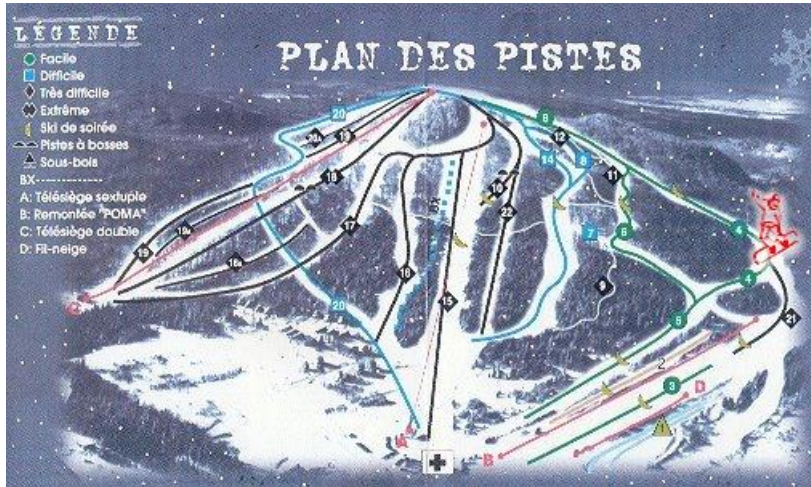


Figure 81: Mont Original, Quebec. Artist unknown, 2004. One of few ski maps that show it to be snowing. Accessed from skimap.org on April 18, 2015.

Several other resorts that offer night-skiing also chose to display the mountain after dark with stars, the moon, or even the northern lights decorating the sky. Figure 82 shows a specialized nighttime view of Alyeska Resort in Alaska, in which the sky fills half of the image. Such a large sky is unusual for ski maps, but in this case the northern lights are undoubtedly a major attraction for nighttime skiers, and are a practical addition to the map for marketing purposes.

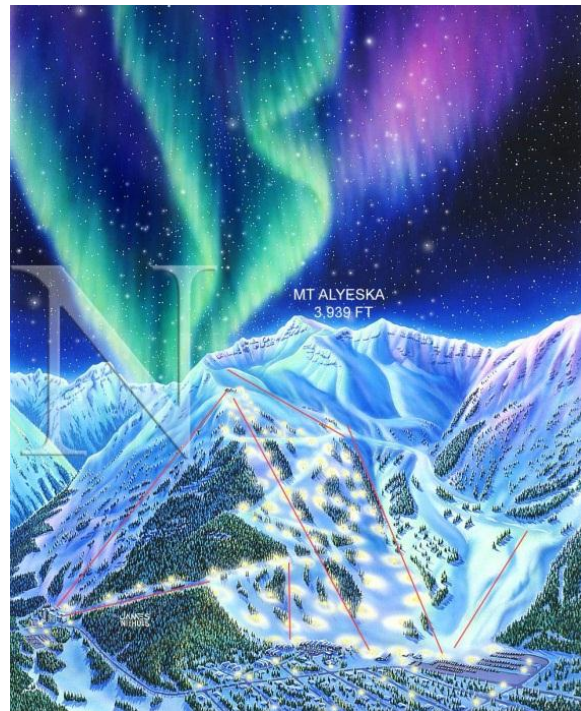


Figure 82: Alyeska, Alaska (with watermark). James Niehues, date unknown. The northern lights featured prominently at a resort that offers night-skiing. Accessed from www.jamesniehues.com on April 18, 2015.

night-skiing trails on the map (Figure 81). These particular resorts may justify the addition of falling snow because it is unavoidably cold after dark, and a couple snowflakes may not detract from the overall appeal of the map.

8.6 Foreground

A reoccurring design technique seen in several ski maps is the addition of objects to the foreground of the image. This technique is seen exclusively with the panorama view type, where the depth of field makes layering objects on different planes possible. Trees are the most common addition, although buildings, people, and even animals were also seen in the foreground of some maps (Figures 83, 84, 85, and 86). This design technique helps to frame the map, and also brings a sense of intimacy to image, as if the mountain scene is being brought closer to the viewer. Prominent ski maps artists such as James Niehues, Bill Brown, and Hal Shelton have utilized this technique in several of their maps.

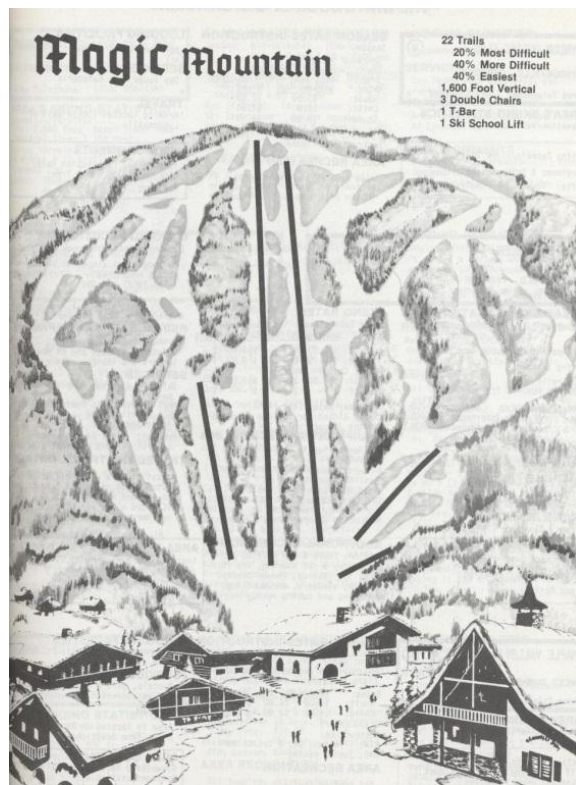


Figure 83: Magic Mountain, Colorado. Artist unknown, 1980. This map shows buildings in the foreground. Accessed from skimap.org on April 21, 2015.

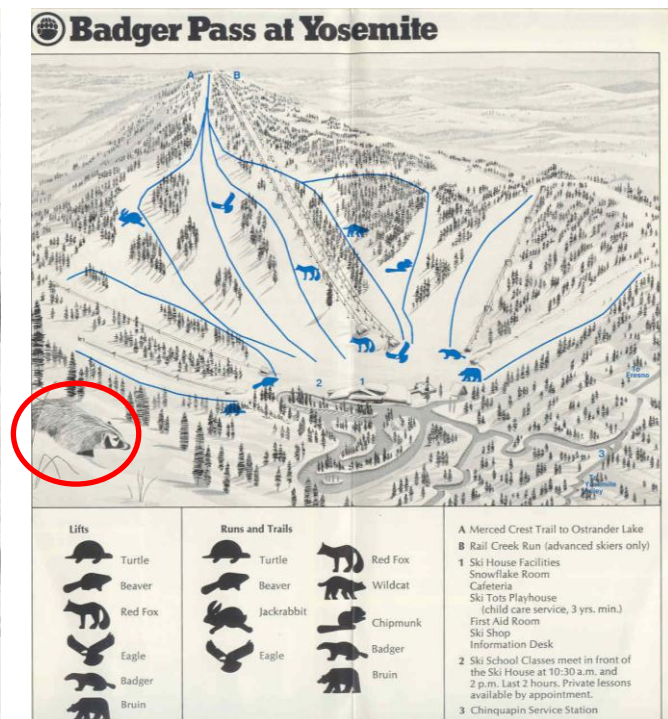


Figure 84: Badger Pass, California. Artist unknown, 1972. This map shows a badger in the foreground (highlighted by the red circle) referencing the name of the resort. Accessed from skimap.org on April 21, 2015.

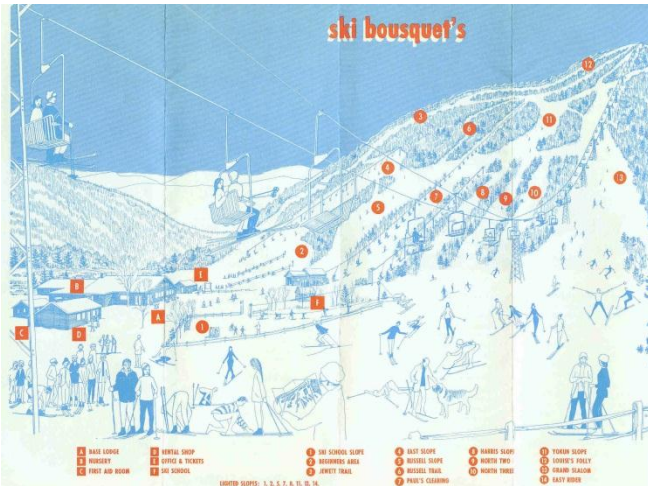


Figure 85: Bousquet, Massachusetts. Artist unknown, 1970. This map shows skiers and a ski lift in the foreground. It is also one of the only maps to include people. Accessed from skimap.org on April 21, 2015.

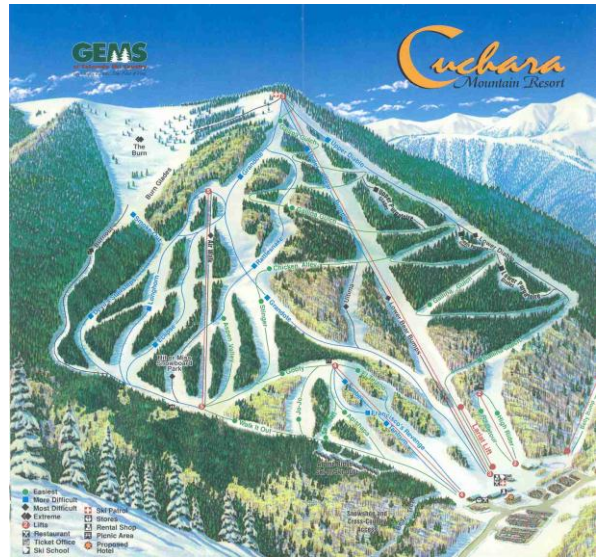


Figure 86: Cuchara, Colorado. Artist unknown, 1999. Trees are most commonly shown in the foreground. Accessed from skimap.org on April 21, 2015.

8.7 Signatures

Only about a third of the maps collected for the database included the artist's signature or were otherwise identifiable. The remaining maps did not include a signature at all, or included a signature that was illegible. Additionally, it was not uncommon to see signatures that had been partially obscured or in some cases, cropped or edited off the map entirely (Figures 87 and 88). Some ski map artists, like James Niehues, have learned to place their signature away from the edge of the image, where it is less likely to be covered or cropped.



Figure 87: Arizona Snowbowl, 2010 and 2011. Bill Brown's signature is partially covered in the 2011 map by ancillary information.

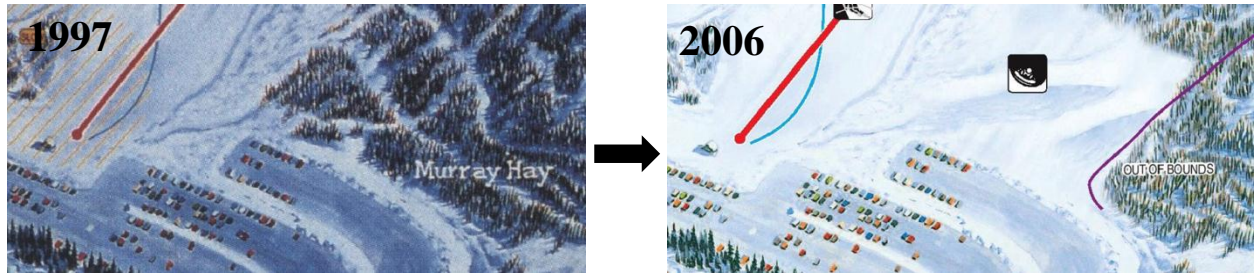


Figure 88: Alyeska, Alaska, 1997 and 2006. With the addition of a tubing park, Murray Hay's signature is edited off the map. Hay's name does not appear anywhere on the 2006 map.

8.8 Trail Ratings

Standardization of the ski trail rating system occurred in the late 1960s, establishing the symbols we are accustomed to seeing today: a green circle for the easiest, a blue square for the more difficult, and a black diamond for the most difficult trails (Figure 89). The purpose of this standardization was to make ski resorts a safer place by advertising a universally understood



Figure 89: An example of the standard trail rating system.

system on the map and on the mountain. The rating symbols were originally developed by The Walt Disney Company, which was planning to build a Disney themed ski resort in Mineral King, California. The trail symbols were designed to be quickly and easily understood by just about anyone, and were even tested by skiers for effectiveness (Fry and Cram 2012). The three resulting differently colored geometric shapes are unambiguous, color-blind friendly, and intuitively provide information about the trail. For example, the symbol's shape reflects the corresponding slope's degree of difficulty. A circle represents the easiest trails because it is seen as soft and smooth. The sharp angles of a diamond are perceived as extreme and therefore represent the most difficult trails. Similarly, the colors of the symbols unconsciously provoke certain feelings and emotions that Western culture has attached to certain hues. Green is recognized as the color of health and safety, appropriate for beginner-level trails; black is

associated with death and fear, suitable for warning skiers of possible dangers on the most difficult trails (QSX Software Group 2015). Although the Disney resort was never built, its carefully designed symbols were adopted by the National Ski Areas Association (NSAA) in 1967 and are in use today by hundreds of resorts across North America.

Many resorts did not immediately embrace the new trail symbols, and “non-standard” symbols were commonly seen until about 1980. Non-standard trail symbols also usually consisted of colored geometric shapes, but were less intuitive than the NSAA standards (Figure 90). Today, non-standard trail ratings systems are extremely rare and are only seen at a few small resorts.



Figure 90: An example of a commonly seen non-standard trail rating system. Magic Mountain, Vermont 1970.

8.9 Alterations

Many ski resorts revise or completely redesign their trail map every few seasons (Figures 91, 92, and 93). Reasons for the alterations vary; corrections to the map may need to be made or the resort may simply want a fresh new look. The ultimate goal is to produce a trail map that is as accurate as possible, and is also visually appealing and enticing to potential customers. One of the most common causes of ski map alteration is the addition of new skiable terrain. According to James Niehues, one of ski resorts’ biggest concerns when discussing the design on the trail map is the possibility of later expansion (Niehues 2015). To alleviate the process of eventually updating the map without starting completely over, Niehues designs the map with potential areas of expansions in mind. He also uses gouache (an opaque watercolor paint) which makes later adjustments easier (Weyland 2004).



Figure 91: Sugar Bowl, California. By James Niehues, 1997 and 2013. In addition to the alterations made to the overall color and sky, Lake Tahoe is removed from the background of the 2013 map. Lake Tahoe is not actually visible from any of the peaks within the resort, and was probably removed so as to not be misleading.

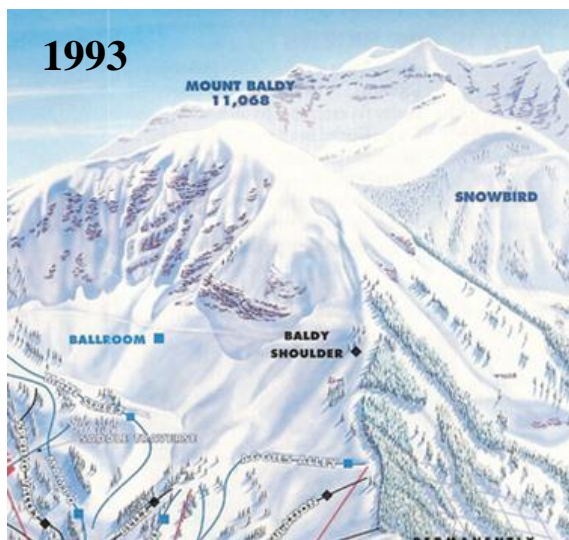


Figure 92: Alta, Utah. By James Niehues, 1993 and 2004. In addition to the changes made to the color saturation, Snowbird (another resort) was removed from the map of Alta in 2004. Snowbird was probably removed because Alta did not want to their customers to be attracted to another resort, and instead wanted keep the focus on their own resort.

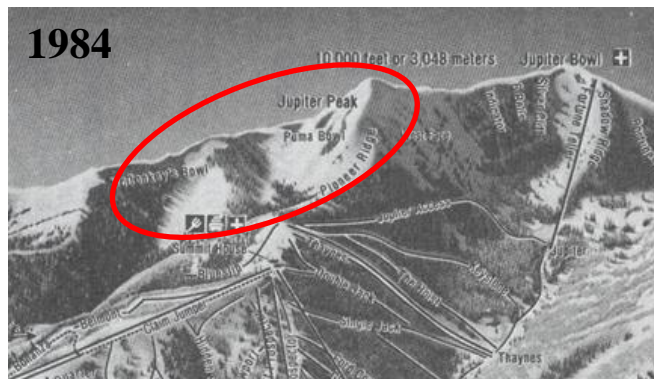
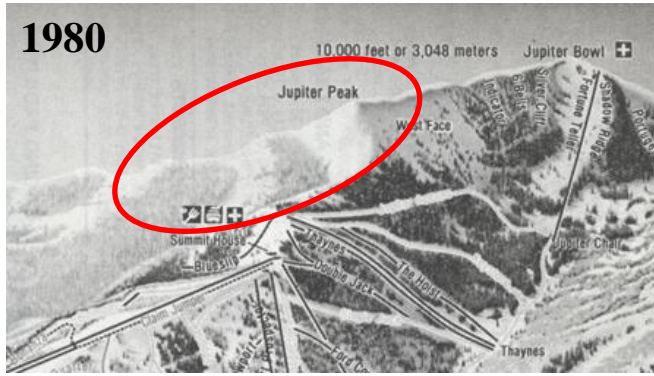


Figure 93: Park City, Utah. By Bill Brown, 1980 and 1984. Terrain below Jupiter Peak is added to the resort sometime between 1980 and 1984, and the map is edited to show the new ski area in more detail (highlighted in red). Jupiter Peak is heightened so that it appears the same elevation as Jupiter Bowl, which is actually more accurate than the 1980 version. In reality, Jupiter Peak is only 28 feet shorter than Jupiter Bowl.

8.10 Parking Lots

During the late 1800s and the first several years of the 1900s most skiers travelled to small ski hills by train, limiting the need for parking areas. In 1908 the Ford Motor Company introduced the Model T, which is widely considered to be the first affordable and practical automobile available to the American middle class (Ford Motor Company 2012). Car ownership soon became a reality for the every-day worker, and the number of skiers driving to resorts increased. The resorts responded by designating small areas specifically for the “parking [of] automobiles” and labeled the lots on their maps (Figure 94). Today, the vast majority of skiers drive



Figure 94: Mt. Baker, Washington. Artist unknown, 1936. The legend of this trail map specifies that the designated parking areas are “for automobiles,” highlighted by the red box.

to resorts, prompting many resorts to proudly display their extensive parking areas on the trail map (Figure 95).

Whether or not the parking areas are shown full or empty varies by artist and resort. The technique of filling the parking lots with cars is practiced by several of the most prominent map painters, including Shelton, Brown, Hay, Mastin, and Niehues. Niehues comments that he usually fills the parking lots to about 75% of capacity, which makes the



Figure 95: Whitetail, Pennsylvania. By James Niehues, 2011. This trail map shows a good view of the extensive parking offered by the resort. Niehues usually paints the cars red, black, white, blue, and yellow because they reproduce the best. Accessed from skimap.org on 4/25/15.

resort appear popular and inviting but not overcrowded (Niehues 2015). A few trail maps even included busses in the parking lots, probably to make the resort appear especially desirable or to advertise a convenient shuttle service (Figure 96).



Figure 96: Giant's Ridge, Minnesota. Artist unknown, 2011. This trail map displays several busses in the parking lot, a subtle hint that the resort is so popular busses are needed to drop off all the visitors.

Some trail maps display the parking lots completely empty, including maps by VistaMap and Terragraphics (Figure 97). Empty parking lots are possibly preferred by some artists and resorts because they make the overall scene appear less cluttered and uncrowded to visitors.



Figure 97: Pat's Peak, New Hampshire. By Vista Map, 1995. VistaMap is one of a few artists that choose to display the parking lots completely empty of cars.

8.11 The Evolution of Ski Map Style and Design

In the beginning, many ski resort maps in North America were rather modest views created by local artists. In the 1960s, an increase in competition led to a demand for more elaborate maps that would impress potential customers. Hal Shelton responded to this demand and became one of the earliest artists in North America to make ski resort mapping his career. Shelton hand-painted the resorts viewed from above at an oblique angle, a style perfected by the Austrian painter Heinrich Berann. This high-quality hand-painted “panorama” style of ski map was soon seen at resorts across North America, helping resorts to appear elite and desirable. The hand-painted panorama remained the choice style of most resorts for several decades, essentially becoming the standard in the ski mapping industry. The influence of computers began to challenge this tradition beginning in the 1970s, but hand-painted ski maps are still commonly seen today thanks in large part to one man: James Niehues.

8.12 The Future of Ski Resort Mapping

James Niehues' hand-painted maps have dominated the ski mapping industry since the early 1990s, but he may be the last of a long legacy of resort painters. In 2007, Niehues speculated that the tradition is a "dying art" and that he may be the last artist to hand paint trail maps for ski resorts (Phillips). Niehues is now in semi-retirement, but has recently been contacted by an individual interested in an apprenticeship. Niehues is optimistic that this individual will be successful, but is also realistic about the difficulties of being a manual artist in a culture obsessed with technology. When asked if he thinks the future of ski resort mapping will tend toward the digital world, Niehues sadly admits; "I think it will, as the general public accepts more and more of the computer image that it'll just kinda drift that way" (Niehues 2015). Although significant advancements have been made in the technology of computer-rendered terrain, Niehues asserts that his maps are still superior. "[T]he mind is still more adaptable and creative [than computers] in presentation. I can stretch, bend, turn, or twist parts of the mountain individually without affecting other elements...and it is almost instantaneous in my mind...just [with] practice," Niehues stated in an interview in 2011 (Blanchard). At this point in time, computers do not have the ability to successfully and automatically alter the terrain the same way that Niehues does mentally, although many attempts have been made in the academic world. Several papers exist concerning the cartographic techniques and methods for creating effective panoramic maps (Patterson 2000, Patterson 2001, Premoze 2002, Jenny 2004, Patterson 2005, Bratkova et al. 2009, Jenny et al. 2011, Domajnko et al. 2012).

In the professional world, mapping companies are practicing new computer technologies to make a profit in the ski map industry. Peter Powers of Terragraphics, Gary Millikin of VistaMap, and Alex Tait of International Mapping are a few artists that have successfully created ski maps entirely using computers. Tait's method began with a DEM that was rendered in a 3D

modeling software called Bryce, and then finally manipulated in Adobe Photoshop. His objective was to mimic the style of the professional painters before him, while automating certain processes with a computer (Tait 2015). However, when survey respondents were asked to compare two maps of Northstar in California, one computer-rendered by Alex Tait and the other one hand-painted by James Niehues, the majority of respondents (85%) preferred the hand-painted version. Many of the respondents commented that they preferred Niehues' rendition of the mountain because it was easy to interpret and visually appealing. Ironically, there were also several comments that Niehues' map made the resort appear bigger and more spread out, even though Tait was actually commissioned to remap the resort to look bigger (Tait 2015). Although the majority of respondents preferred the painted map of Northstar, the computer-rendered version was over six years old at the time of the survey and 3D modeling technologies have since improved. Tait noted that if he were to redo the ski map today he would use a different modeling program by e-on software called Vue to produce photo-realistic scenes of the resort (Figure 98). It is possible that these ultra-lifelike computer-modeled scenes may be the future of ski resort mapping.



Figure 98: "Cold Summer..." by Pavel Huerta. Scenes like this photorealistic computer-rendered mountain landscape may be the future of ski mapping. Accessed from www.e-onsoftware.com.

Other routes explored as the possible future direction of ski resort mapping were GPS-enabled smartphone applications and wearable augmented reality devices. GPS-enabled smartphone mapping applications of ski resorts have been around for several years, and survey respondents were asked whether they would use such an application. An unanticipated 76% showed at least some interest. Many respondents commented that it would be useful for navigation and were in favor of or already using smartphone trail map applications. The most common concern was in regard to the reliability of the device/application. If the device or application fails, a skier at an unfamiliar resort could easily become disoriented without a paper map as a backup.

Many respondents also commented that the application was an unnecessary hassle, largely because the application requires the user to take out their expensive smartphone where it could easily be lost or destroyed, remove their gloves in the cold weather, and then zoom and pan around the map on a small and highly-reflective screen. Although the advantages of GPS-enabled ski maps are indisputable, some major design changes are likely needed before they could ever completely replace traditional paper maps.

Survey respondents were also questioned whether or not they would use specially designed ski goggles that would overlay directions and other information onto their natural view field (called augmented reality). The majority (53%) responded negatively, with many comments that the device would be too distracting and a consequent safety hazard. Skiing is an inherently dangerous activity, and any distractions (especially updating information blocking your view) may result in serious injury. Fortunately, these special ski goggles are neither widely available nor affordable and are currently only used by the most advanced and extreme skiers. But as the

technology advances and becomes cheaper, it is possible that we may see more augmented reality ski goggles being used at resorts in the future.

At this point in time, printed maps seem to be the most advantageous form of map to use while skiing, regardless of how they were initially created. Although mobile maps and special ski goggles do have some advantages, it does not appear that they will completely replace printed ski maps any time soon. Even in our technology driven world, the preference for printed maps is strong. “They really serve a function... To have one of these [printed maps] out on the slopes, a 10’ x 6’ board that people can just ski up to, take a look at it, and get a quick orientation of the mountain, it’s just usually helpful” (Tait 2015). Printed ski maps have been the norm for so long that some skiers may not be ready to accept such a drastic change. 87% of survey respondents reported that they have kept at least one official trail map from a resort, mostly as souvenirs. “People just seem to like [printed maps]... I don’t see [them] going away” (Tait 2015).

8.13 Final Thoughts

Overall, the research found that the hand-painted panoramic style of ski map is the most common type of ski map in North America and is the favorite among skiers. Although successful examples of other ski map styles exist, hand-painted panoramas have been preferred by ski resorts since the early days of Hal Shelton and are in use by the vast majority of large resorts in North America. Recent advancements in computer technology have begun to challenge this long-standing tradition, although digitally-rendered ski maps are rare. Mobile mapping alternatives also exist, but are not widely used by skiers. In the future, it is possible that improvements to this existing technology may seriously threaten the practice of hand-painting panoramas of ski resorts, especially when James Niehues is fully retired. But as of now, this traditional style is still preferred by resorts and skiers alike.

9. LIMITATIONS AND FUTURE RESEARCH

The ski maps analyzed in this thesis were limited to the collection hosted online by skimap.org, a non-profit website dependent on users to upload ski maps. The website lacks many maps prior to 1960, most likely because many of these older maps have been lost, destroyed, or exist solely as a paper format in archives or museum collections. A lack of time and funding prohibited a more exhaustive investigation of vintage ski maps, although it may have helped provide a more accurate story of ski map history and is recommended for future research.

Another possibility for future research would be to focus the concepts discussed in this thesis on one or a few resorts, preferably with long and diversified mapping histories. This would involve an extensive investigation to track down every map that the resorts have published over the years. The following examination would provide a detailed analysis of the evolution of map style and design for the selected resorts. Do the maps for each resort tend to have similar features throughout the years, despite changing artists or styles? How do resorts alter their maps, and what are the possible reasons behind doing so? This small-scale examination of ski map style and design would be an appropriate complement to the more general analysis completed in this thesis. Finally, ski industry marketers could be contacted to see how the maps fit into the overall advertising strategy of the resort.

10. CONCLUSION

North America's first modern ski resort opened to the public in 1936 in Sun Valley, Idaho. In the 1960s, the ski resort industry saw a period of rapid growth and expansion that intensified competition between resorts and escalated the need for effective advertising. With the help of talented artists like Hal Shelton and Bill Brown, resorts began producing elaborate maps to promote their mountain and attract new customers. Over the years, these ski maps have

accumulated into a massive collection that had never been thoroughly analyzed until this thesis. A total of 1,779 historical and modern maps were gathered and catalogued into an Access database to help gain a clear understanding of ski map style and design over time. Interviews with Alex Tait and James Niehues provided more important information. To address the second research question of how skiers perceive modern ski map styles and features, an online quantitative survey was conducted. A total of 125 people across North America were asked to provide their opinions and attitudes concerning various aspects of ski maps. Among other things, it was found that most of the survey respondents preferred the traditional painted panoramic style over other styles of printed ski maps, and many were hesitant about the effectiveness of newer mobile ski mapping alternatives.

These methods revealed a rich tradition of hand painting panoramic ski resort maps, sustained by only a few artists at a time. In more recent years, advancements in computer technology have led to an increase in digitally-rendered ski maps that may threaten the practice of hand-painting scenes, especially as the public becomes more and more receptive to computer graphics. The impending retirement of prominent ski map artist James Niehues further amplifies the uncertain future of hand painted ski maps.

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APPENDIX 1

Default Question Block

Thank you for your interest in this survey! This survey asks about your opinions and preferences concerning trail maps of ski resorts in North America. This survey is completely voluntary and your responses will be confidential. Your name and contact information will ONLY be used if you are selected to receive the free lift ticket. All contact information will be deleted after the study is completed.

There are no anticipated risks or discomforts associated with taking this survey. Your involvement with this study will help to understand the public's perceptions of modern day ski maps in North America for a graduate thesis project at the University of Montana.

It should take about 15 minutes to complete the questionnaire. By completing the questionnaire, you imply your consent to participate in this study. You may stop at any time or skip any question you do not wish to answer. All your answers will be confidential, I will only report summaries of my findings.

To be qualified to participate in this study, you must be at least 18 years of age or older and have some familiarity with ski resort maps.

Don't forget to enter your name and contact information at the end of the survey to be entered in the drawing to win a free lift ticket for Montana Snowbowl!

If you have any questions, please contact me at the address below.

Sincerely,
Amy Lippus
University of Montana
Department of Geography
amy.lippus@umconnect.umt.edu
(408) 761-8569

How would you identify yourself in terms of what snowsport you participate in at ski resorts?

- I am a skier.
- I am a snowboarder.
- I typically ski, but sometimes I snowboard.
- I typically snowboard, but sometimes I ski.
- I snowboard and ski equal amounts.
- Other

When visiting a ski resort for the *first couple of times*, how often do you refer to the official trail map (pamphlet or info-board)?

- Never
- Almost Never (Just a couple times throughout the day)
- Occasionally (Before some runs)
- Almost Every Time (Before most runs)
- Every Time (Before every run)

Comment about your use of trail maps at *unfamiliar* ski resorts below.

When *returning* to a ski resort you have previously been to *at least five times*, how often do you refer to the official trail map (pamphlet or info-board)?

- Never
- Almost Never (Just a couple times throughout the day)
- Occasionally (Before some runs)
- Almost Every Time (Before most runs)
- Every Time (Before every run)

Comment about your use of trail maps at *familiar* ski resorts below.

Have you ever brought home or kept an official trail map provided by a ski resort?

- Yes
- No

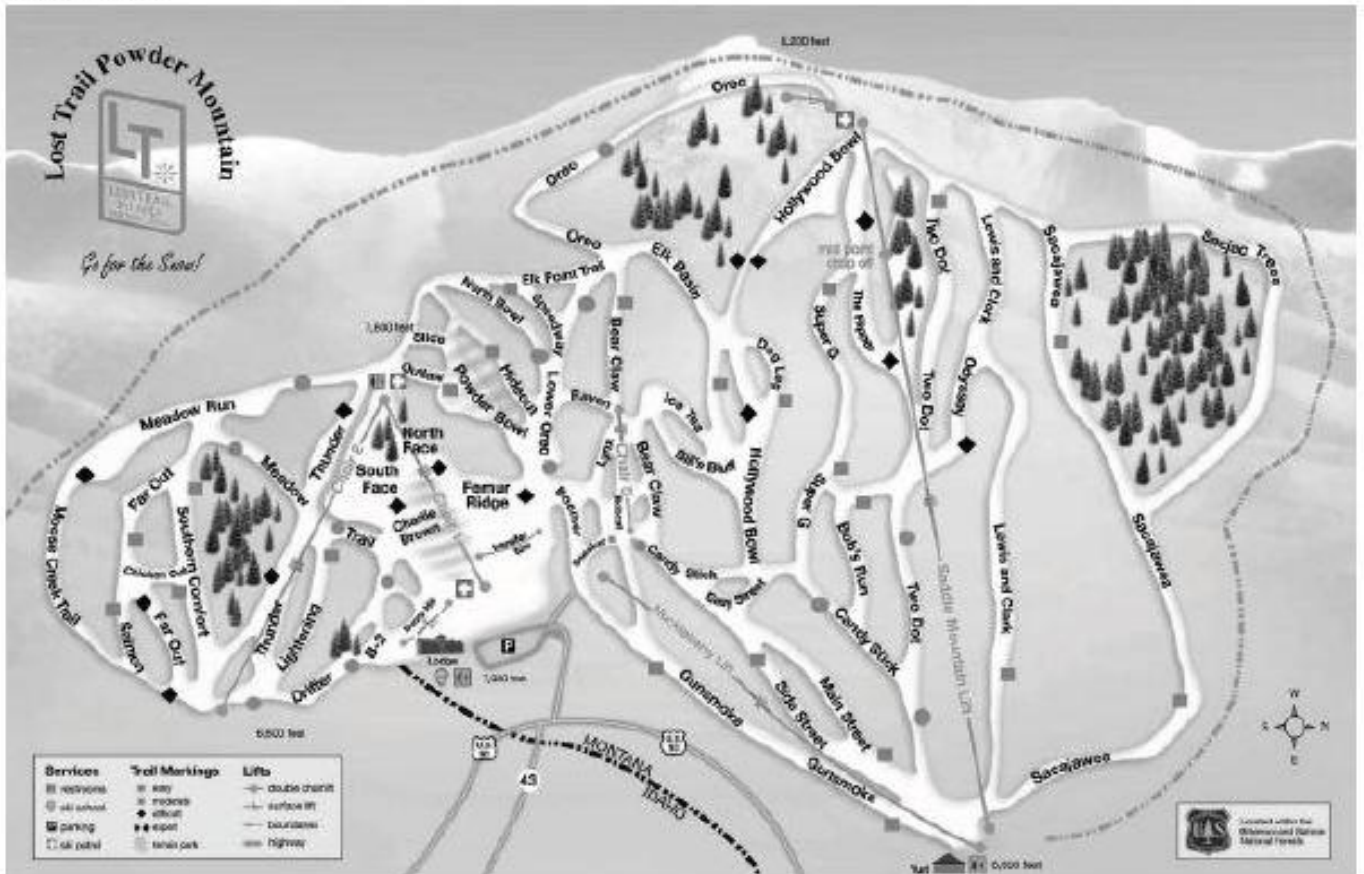
Why did you keep the trail map?

How well do you typically understand maps?

- I usually have a very hard time with them.
- I sometimes have trouble figuring them out.
- I have a pretty average understanding of maps and how they work.
- I have a pretty good understanding of maps.
- I understand maps very well.

The following three maps show a ski resort using a different perspective (angle of view) for each. Select your favorite map based on your preference for *perspective*. Click to enlarge the maps. (color has been removed to reduce bias)

Horizontal View



Straight-Down View



Why is the map you selected your preferred perspective (angle of view)?

The following maps are of four different ski resorts. Select your favorite map based on your preference for the **overall appearance of the background landscape**. This includes the forest, buildings, rocks, cliff, sky, clouds, ice/snow, waterbodies, color, and shading. Please try to ignore the text, symbols, and lift/trail route lines. Click to enlarge the maps.

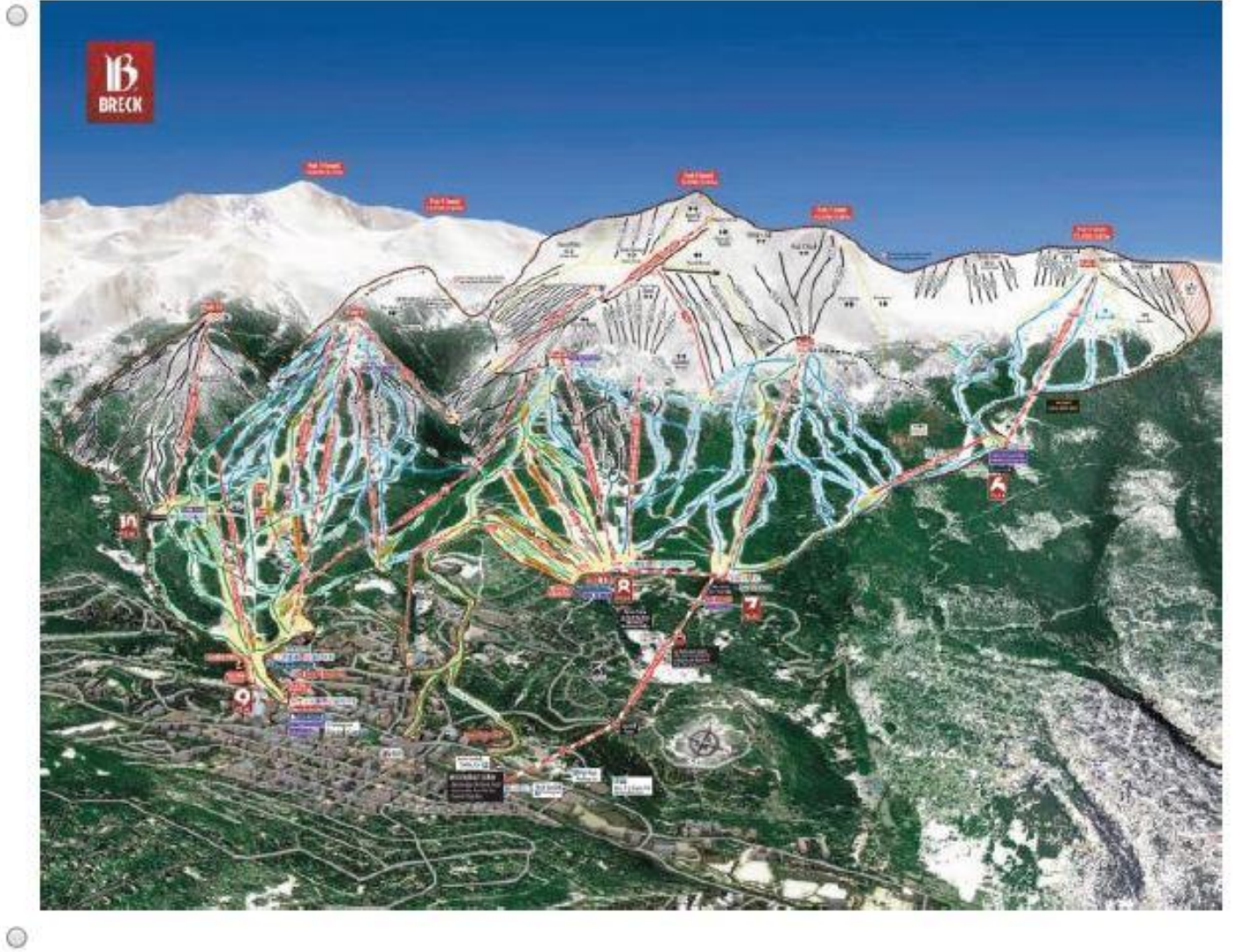






Why do you prefer the image that you selected as your favorite?

The following two maps are of the *same* resort, with slight differences. Which map do you prefer? Click to enlarge the maps.





Why do you prefer the image that you selected as your favorite?

The following two maps are of the *same* resort, with slight differences. Which map do you prefer? Click to enlarge the maps.



Why do you prefer the image that you selected as your favorite?

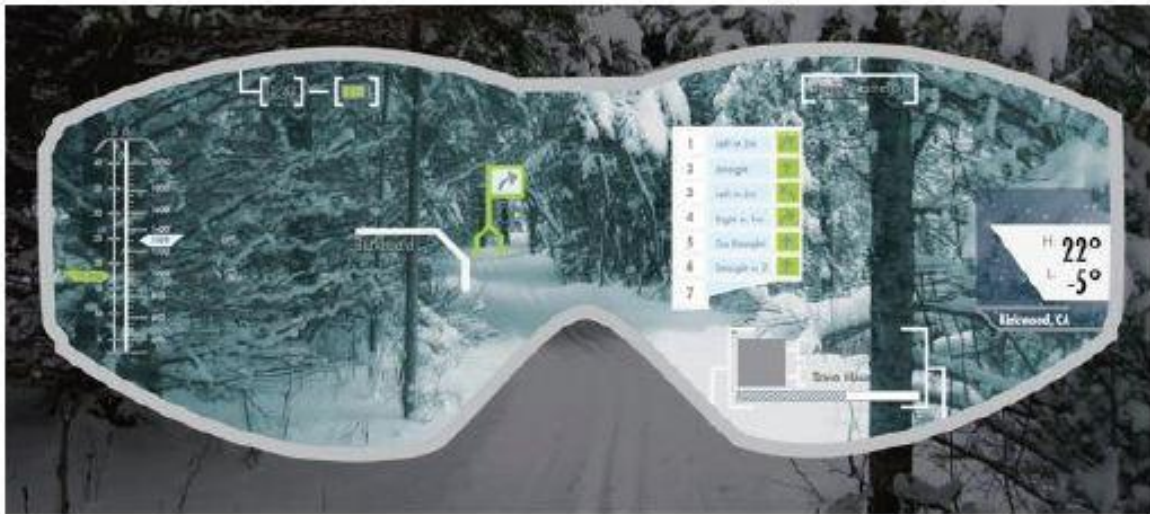
The following two maps are of the *same* resort, with slight differences. Which map do you prefer? Click to enlarge the maps.





Why do you prefer the image that you selected as your favorite?

Some sportswear outfitters have recently developed ski goggles that overlay information about navigation, weather, and user statistics (speed, altitude, etc.) onto the user's natural view (see picture). Is this something you would be interested in using at ski resorts?



- Yes
- Yes, in combination with a traditional ski map
- Maybe
- No

What are your opinions/concerns about this special type of ski goggle?

Some ski resorts offer smartphone applications that include GPS-enabled trail maps (see image) that provide the user's current location on the map in real-time. If a GPS-enabled map was offered by a smartphone application at the resort of your choice, would you use it?



- Yes.
- Yes, in combination with a traditional ski map.
- Maybe.
- No, and I *DO* own a smartphone.
- No, and I *DO NOT* own a smartphone.

What are your opinions/concerns about smartphone ski resort trail map applications?

Is a north arrow (highlighted by a red circle) on the ski map important to you for navigation?



- Very Important
- Somewhat Important
- Not Important
- I am not familiar with north arrows

What is your gender?

- Male
- Female
- Other

What is your age?

- 18-23
- 24-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70+

What is your highest completed level of education?

- No High School
- High School, no degree
- High School Graduate (or equivalent)
- Some College (1-4 years, no degree)
- Associate's Degree
- Bachelor's Degree
- Master's Degree
- Professional Degree
- Doctorate Degree

Please provide your name and preferred method of contact (email or phone number).

****Your contact information will NOT be shared with any third parties and you will NOT receive any spam. Your contact information will only be used to contact you if you win the lift ticket.****

APPENDIX 2

Interview with James Niehues

Monday February 9th, 2015 3:30 PM

24 minutes 15 seconds

Amy Lippus: First of all, do you consider yourself a cartographer, artist, or both?

James Niehues: *[laughter]* I guess I really consider myself an artist. I used to consider myself a cartographer, but I don't work with necessarily accurate dimensions in width and length and ya know it's a mile represent by a certain segment.

AL: Yeah.

JN: Because I may have a mile in perspective, well obviously it is. The farther away it gets ya know the miles become diminished and the actual length represented on paper.

AL: Yeah. So have you ever taken any cartography or geography classes?

JN: No I haven't. I took some courses in a junior college and then was gonna be drafted, so instead of being drafted into the army I enlisted and after serving I got back and just started working. I had a wife at that time and so I just jumped right into the job market.

AL: So I know you've admired the work of Berann and Hal Shelton and Bill Brown, are there any other artists you look to for inspiration in your work?

JN: Well I have ya know there's Murray Hay up in Canada that I always enjoyed looking at, I don't know if you mentioned him or not but as far as the uh, and ya know and then there's in Europe there's... oh...*[laughter]* just a second here...

AL: No problem.

JN: Pardon?

AL: No problem.

JN: Oh ok. I don't know why I can't think of his name.

AL: Is it Heinrich Berann?

JN: I'm sorry what was that?

AL: Heinrich Berann? Is that who you're thinking of?

JN: Oh yeah yeah yeah, of course. Yeah yeah.

AL: Okay, yes. *[laughter]*

JN: *[laughter]* I'm having a little hard time understanding you, I don't know if it's because it's on speakerphone or what but if I keep asking you to repeat I'm sorry.

AL: Oh okay that's alright. So can you say a few words about why you think the human mind is superior to a computer at creating panoramic views?

JN: Well it's more flexible.

AL: Yes.

JN: There isn't any parameters, there isn't any formulas.

AL: Yeah.

JN: Our mind works in a very flexible way and whenever I visualize something and I'm sure many other people too if they see these things from the air and fly around it, once it's in the mind you can just distort these things in a way that they'll come together and flow and be true to the way that it's traversed or true to the way that a skier would ski it.

AL: Yes. You are very good at doing that. *[laughter]*

JN: Thank you!

AL: You're welcome! So I've been looking at a lot of your maps recently and I've noticed that sometimes your signature is either partially or entirely obscured. So how do you feel about your signature sometimes not making it?

JN: *[laughter]* Well originally my signature was just a block letters.

AL: Yeah.

JN: And then I had the opportunity to do some more sketchy type of trail maps, well just one or two, and when I did them I decided I really wanted a different signature so I did a script and then around 2000 I decided to move on to the script with the initial letters and block letters behind.

AL: Okay.

JN: Just to, ya know I guess it just kinda identifies a certain stage of my maps.

AL: So I read in one interview that sometimes you will call up a resort and ask them to remove your name from a map because they have distorted the color or proportions. So how much distortion must happen before you demand removal of your name?

JN: Oh boy, that's just very flexible. I mean if I looked at one and say "oh my gosh" ya know they just spread that map now just to fill the space.

AL: uh huh.

JN: It doesn't happen very often. I don't think I've asked more than 2 or 3 ski areas to remove my name but it usually comes from not necessarily being distorted vertically or horizontally so

much as to when they add trails and there's a graphic artist out there that doesn't know what they're doing.

AL: Yeah.

JN: And just doesn't do a very good job of putting the new trails in.

AL: Okay. So what are some of the most common things resorts ask for in their map?

JN: Ya know...I don't have clients ask me for anything in a map.

AL: Really.

JN: I have had a few after they see the sketch say well I want it to look taller.

AL: Okay.

JN: Or I want it too look bigger. Ya know so other than that, whenever I take on a project, I guess I've been in the business long enough that they know what they're getting, and they don't really ask for anything special. In fact, I go into a lot of meetings and it'll just be small talk and we gotta do this and this and basically, there is one thing. There is the concern of any future additions.

AL: Yeah, okay.

JN: Expansion. So we certainly cover the future expansion to make sure we've got that part of the covered so in the future we can simply add the trails in and be done with it ya know.

AL: Yeah. So they kinda know what they're in for when they get you on the phone and ask you to do their map for them?

JN: Yeah, hope so.

AL: *[laughter]* Yeah okay.

JN: *[laughter]* I got enough of them out there.

AL: Yeah, you do now. So some resorts will add north arrows onto your final map. Do you think north arrows are useful for navigation on your ski resort maps?

JN: *[pause]* That depends. Ya know if it's a flat faced mountain, yes.

AL: Yeah.

JN: But I don't think that it's that crucial because a lot of the skiers there are guests and some of them are kinda turned around anyway and if they're gonna look at the sun and try to figure out which is north, it's kinda hard to do sometimes, but then if it's a multi-faced mountain, north is not true for all portions of the illustration.

AL: Yeah.

JN: So it becomes a very interpretive thing as to what true north is.

AL: Yes, I agree. *[laughter]* Alright, so especially with some of the larger resorts you have redone their map several times. For example, you redid the map for Heavenly at least four times by my count. What are some of the common reasons that resorts request you to redesign their trail map?

JN: Well if we go to the Heavenly example,

AL: Yeah.

JN: They have a real unique problem in getting skiers from one side to the other.

AL: Yeah.

JN: So it gets confusing for people to ski from the California side over to the Nevada side. And so the main reasons for redoing that was because the person that I worked with decided that they'd like to try a different way and so we'd go and try that. The latest one was the satellite view and that's worked very well for them.

AL: Mmkay.

JN: So the main reason for changing that one was because of the difficulty they were having of getting people around the mountain. And then the other reasons of course is usually there's an addition onto the mountain that they would want to highlight so they'd want to bring up more in the perspective then maybe the rest of the mountain or something and a lot of time you'll just get somebody that just wants a new look. Ya know just wants to redo it.

AL: Mhmm. So when you redo a map for a resort do you start completely fresh or do you refer to the previous paintings for ideas and reference or is it just kind of all a fresh start?

JN: Well I'll certainly go back and see what I did and you know review it and make sure that I had it right and with the new considerations that they may have whether a different perspective is gonna be better or whether I can just add to it. So it's...No I always go back and look at things that I've done in the past. Lots of times, especially with color I'll go back and say "Oh wow." I'll pull out my old painting and look at it and thought "Wow I've kinda gotten away from this, I kinda like it. I should get back to it."

AL: *[laughter]*

JN: So a lot of times it's nice to go back and see what I've done in the past cause I'm constantly changing the palette a little bit and doing things a little differently as I go along.

AL: Mmkay. So how does regional physical geography affect the way you paint the landscape? So for example you have stated before that you use more reds in New Mexico and fewer trees in New Zealand. Are there any other geographic or regional trends you have noticed and how does it affect your painting?

JN: *[pause]* I'm sorry I didn't quite understand that. The New Zealand stuff, basically I'm interpreting the land and the features as they are. And like in the New Zealand stuff of course there's just no trees.

AL: Yeah.

JN: So what I'm more interested in, than anything else, is first of all getting the skier down the mountain safely.

AL: Yeah.

JN: Or translating the map so that the skier can best know where they are on the mountain. Now I guess that can be done with simple lines but the other really big factor is to make it attractive to the skier so that it becomes a very valuable tool for the resort. And making it accurate and showing especially the trees because there's conifers and deciduous trees and that's part of the identity wherever you're skiing around the slope you can look out at the side and see if you're in conifers or if you're in deciduous trees.

AL: Yeah.

JN: So that becomes very important to me. But as far as the color, one of my very biggest concerns from the very beginning was how do I make every mountain look different and distinctive and become identifiable, that artwork with that mountain. And it's really hard to do whenever you got most your ski areas in spruce trees and looking pretty much the same as far as the treatment goes. So sometimes I'll see a mountain, for instance, Whitefish, I saw that where it was Big Mountain but I happened to fly that in the later afternoon and noticed the alpenglow on it and so that's the way that I painted it.

AL: Mhmm. So do you find that deciduous trees are harder or easier to paint than the conifers?

JN: Deciduous are harder.

AL: Yeah. More time consuming?

JN: Basically, whenever you're out skiing it's just a bunch of trunks and sticks, however, if you happen to be out there skiing early in the morning, and the frost is on the trees they have this very nice canopy and it's a very pretty sight and so that's what I try to represent in my paintings.

AL: Okay. So-

JN: And paint more of the canopy than worrying about these sticks that're making it up.

AL: Yeah. So one recognizable feature I've noticed in a lot of your maps is a parking lot full of very colorful cars.

JN: *[laughter]*

AL: Is this something that the resorts requested or is kinda something you decided to do on your own?

JN: Well I think that all the artists previous to me have put in full parking lots. I try to leave them about $\frac{3}{4}$ full; I don't want them to be so full that people are thinking that they can't park.

AL: Yeah.

JN: But I have left some second parking lots and third parking lots maybe empty.

AL: Uh-huh.

JN: And I have had the parking lots come back and say “Golly, you’re not painting enough visitors in here for us.”

AL: Yeah.

JN: So, ya know, I try to kinda spread it out so that there’s cars everywhere.

AL: Yeah I’ve always thought it was interesting-

JN: And the colors of cars? Well, what reproduces best probably is the red, black, white, blue; but I really like the yellow.

AL: Yeah.

JN: And they’re aren’t that many yellow cars...

AL: No...

JN: But I really push that. *[laughter]* But I just try to keep it to the basic colors because they reproduce better.

AL: Oh okay. Yeah I’ve always that it was really interesting how the parking lots are always really full of cars but then the slopes were always completely empty of people.

JN: *[laughter]* Well I can’t paint in the people.

AL: Yeah, little too small, huh?

JN: It just becomes dots.

AL: Yeah.

JN: The...oh what else was I gonna say, there’s something else that occurred to me just as we were talking about parking lots but I can’t remember- oh! If it’s a very big ski resort like Vail or Whistler, well the parking lots become so small that I just put in either black or white.

AL: Yeah.

JN: And you know I don’t change the colors. But if it’s a smaller resort, yeah I’ll try to get the colors for different cars in there.

AL: Mmkay. So another recognizable feature I noticed in a lot of your maps is your really vivid, saturated blue sky. Under what circumstances of you decide, or are you allowed to, add clouds?

JN: *[laughter]* Well nobody wants to see clouds.

AL: Yeah. *[laughter]*

JN: Yeah all that snow that's there, boy I don't know how it gets there because it's all sunny skies.

AL: *[laughter]*

JN: *[laughter]* Well you gotta pick a day that you decide to show the skier and they have plenty of sunny days too.

AL: Yes.

JN: So I'll always put in a few clouds, well not always, some of my skies are pure blue.

AL: Uh-huh.

JN: But usually there's a cloud here or there that is a little reminder that snow comes from something.

AL: *[laughter]* Yeah. So I've noticed that the direction of light in your painting differs. How do you decide where the light will come from?

JN: *[pause]* Well normally whenever I'm up doing the aerial photography it'll be around noon. Depending on whether it's facing east which I would probably shoot at about 10 o'clock in the morning. And if it's facing west, very few are, but if its facing in a westerly direction then I pick like 1 o'clock to 2 o'clock to shoot it.

AL: Mmkay.

JN: And so you can generally be sure that my shadows are always in a northerly direction.

AL: Okay. Makes sense.

JN: I painted one, I'll have to tell you this, I don't know if I should or not.

AL: Okay.

JN: But I painted one back in the Midwest that sent me stuff to paint from and it was a day when there wasn't really any shadow, it was a cloudy day.

AL: Yeah.

JN: And so I painted it. It was very early in my career and I happened to paint it with shadows in exactly the opposite direction of what they should be and they saw that and made me change those shadows.

AL: Oh wow.

JN: So ever since then I've been very careful about which way those shadows are.

AL: Oh wow. *[laughter]*

JN: *[laughter]*

AL: So how do you think your own personal style has developed over the years?

JN: *[pause]* I think I've probably striven to make them more realistic. When I first started out, color was a concern because there wasn't a technology available to reproduce a painting like there is today.

AL: Mhmm.

JN: So my very earliest paintings are pretty rich in color to get a realistic color by the time that it was printed. And I think through the years I've trusted that more and become more, more able to reproduce or represent those truer colors. I think I've probably turned my scenes a little more wintry than they were in the beginning.

AL: Okay.

JN: A big concern was to not make a ski area look cold.

AL: Okay.

JN: And ya know I didn't want to portray the coldness of the ski area but more of the warmth.

AL: Alright. So I've read that you are semi-retirement with no prospective apprentices. Is this still true?

JN: Yes and no. I have recently had a contact, somebody contact me, that is presently doing it by computer and he realizes that it's just not as good, and he won't be able to paint an image as well as I can paint them and he wants to come back to the hand-painted images, so he's right now painting some samples for me and I'm kinda answering questions for him if he has some questions that come up but he used to paint more and wants to return to that so we'll see how that comes out.

AL: Cool. So how do you see the future of ski resort mapping? Do you think it's gonna kinda tend away from the paintings or...

JN: I think it will, as the general public accepts more and more of the computer image that it'll just kinda drift that way.

AL: Yeah...

JN: It'll probably be a lost art, I hope that it isn't.

AL: I hope not either.

JN: I hope this person that I speak of, I hope that he can follow through. He's very excited about it and he seems to have the passion to do that and I think if he does maybe, maybe it will come about that he'll carry on for the next twenty years. Hope so.

AL: Yeah, that's great. Alright finally, what is your current count of resort paintings, and if you don't know the exact number off the top of your head, that's fine.

JN: Oh that's okay. I'm right now working on Alta, you can get on my Facebook and see the sketch. I haven't gotten approval on that yet, I probably will within the next few days actually

and then I'll go ahead into the painting stages of it but I'm flying out Wednesday to Park City again and doing Park City Mountain-Canyons. A combination map of the two resorts have come together and are now a Vail company.

AL: Okay. So do you-

JN: And I just finished up a village map of Sun Valley in a winter view. And I've got on the books here to do a revision to Jackson and I've got a regional coming up that I'm really excited about it's a summer view of Chaffee County which has a very nice valley and some very rugged peaks here in Colorado.

AL: So you still have a lot of projects on your hands! *[laughter]*

JN: I guess I'm not really semi-retired here! I'm trying. But then if somebody calls me up with a nice project and I love what I do so I decide I'll take it on. *[laughter]* At least I have the choice now. I have turned down a number of different ski resorts, the smaller ones.

AL: Alright well I think that's all I have for you today.

JN: Okay Amy. Well it was nice talking to you.

AL: It was nice talking to you too. Thank you so much for talking to me. Do you have any last things you wanna say? Any closing remarks or questions or anything like that?

JN: No I think you covered it pretty good.

End of Interview

APPENDIX 3

Interview with Alex Tait

Friday, April 2, 2015 1:00 PM

12 minutes 14 seconds

Amy Lippus: So you're the vice president of International Mapping, correct?

Alex Tait: That's right, yep.

AL: Okay. So what kind of mapping do you do there?

AT: We do a variety of mapping; from work with a couple of government agencies, we do a lot of work with the National Park Service for interpretive displays, for brochures, and that sort of thing. We've done quite a bit of statistical mapping for the U.S. Census Bureau. We do quite a bit of recreational mapping- that's where I put the ski maps that we've done- and then we do a lot of international boundary work. So we work with consultants and various different commercial and government clients for interpretation and research on international boundaries.

AL: So are the ski maps, are they through International Mapping or is that kind of a side project that you do by yourself?

AT: No that's actually done through International Mapping. The contracts with the two that I've done have been in Tahoe, California area.

AL: Yeah, it was Northstar and Sierra at Tahoe right?

AT: Yep that's right. That was actually a while ago I did those and I expected to maybe do a few more but I haven't since then.

AL: Okay. So what prompted you to write that article that you published?

AT: It was just an interesting topic. I had just recently done the Northstar Tahoe map and had looked around at the examples of other things that had been done. Yeah, everybody of course references James Niehues' maps which are ubiquitous now so I was just kind of interested in what had been done and, you know, I like doing 3-D rendering of mountain landscapes and this was a way to, you know, actually get paid to do some of them and I was going to the ITA Mountain Cartography Workshop in Switzerland and I needed something to present so I did a little bit of research on that and, you know, of all the things I've ever done, presented at a conference, this has by far gotten the most attention.

AL: Oh yeah? Cool.

AT: Yeah lots of people, you know, documentary filmmakers working on something right now, just got interviewed for that. You're not the first graduate student that's picked up on it.

AL: Oh really? Cool. So have you done any further research since you wrote that article?

AT: I have actually. I presented at the Mountain Cartography Workshop in Banff last spring.

AL: Oh really?

AT: I haven't written it up yet. So what I was doing is I was looking at a few of the artists, I actually picked four of the artists, and took a look at how they constructed their mountain images, how they distorted reality to present a certain picture of the mountain, so I need to write that up. I'm in the process. It will probably be done in the next month or two.

AL: Cool I'd love to read that when you're done with it if that's alright.

AT: Sure I will add you to the list. You know when you have a full-time job it can be a challenge to write this sort of stuff up.

AL: Cool, well that's really neat. So can you tell me just a little bit about the creation process that you went through to make the map for Northstar and Tahoe?

AT: Sure. We were working, and I think this is not unusual, I was talking to James Niehues about it, I did interview him for the article I did back in 2010, but you tend to work with the marketing directors. I mean they're the ones that are putting together or changing the materials for the mountains of their maps, their brochures, sort of their image that they want to present to the world. So, you know, both Northstar and Sierra at Tahoe wanted their maps to look bigger.

AL: Okay.

AT: And they're actually, you know, reasonably big steep mountains, I don't know if you've ever skied either of them.

AL: I actually have skied both of them.

AT: Yeah they got some steep, steep slopes.

AL: Yeah.

AT: You know they're not as big as some other ones in Tahoe area but they certainly have some steep slopes.

AL: Yeah they're definitely sizable resorts.

AT: The first step is always talking with the client about what they need, about what they want. So after that then I would just start playing around with the digital terrain and make adjustments and pull up peaks here, push down things there. Sierra at Tahoe was particularly challenging because there's this monstrous mountain right in front of it, so it's hard to get a view of the mountain without tamping down, I can't remember what the name of the peak is but it's right across the valley.

AL: Do you start with a DEM and then what programs do you take it into to do all that manipulation?

AT: It's a combination of programs. So at that point my primary dream modeling and rendering program was Bryce. That has since switched to Vue, so if I was doing it again now I would be using that program to do the rendering. But as far as a quick preview of how things are going to work, again this is back in like 2009 when I first did these, I was using Natural Scene Designer to preview stuff and I was using Photoshop to manipulate the DEM. Believe it or not, Photoshop is probably the best program out there for manipulating a DEM as far as raising peaks and lowering peaks and distorting the vertical elevation of things. Bernhard Jenny has since written some really nice tools for bending the terrain and doing all those sorts of things, but as far as just playing around with the distortion like differential distortions of the vertical, Photoshop is still the best.

AL: Okay.

AT: Believe it or not.

AL: As far as like the trees and stuff was that all modeled too or did you like hand place the trees and stuff?

AT: No. So I would create a mask for where the trees needed to be. So obviously you don't want trees in the middle of all the slopes, some of the slopes get some trees in them, but no, those were not placed by hand. Again, I would do this differently now. There's new software that I use called Vue, where it's called ecosystems, so you can create a tree mask and it'll populate trees of whatever species and size you specify onto the terrain. But I wasn't using that, I was using Bryce so those trees are actually little spikes. So there's two terrains. There's an ice terrain and then there's a tree terrain and it spikes the trees through the ice, and so I can put different material textures on each of the- yeah it's an interesting process. Again though, most of that's done in Photoshop. All of the modeled stuff you see in that scene was done Photoshop, including the trees.

AL: Alright. Cool that's really neat.

AT: I really was trying to mimic, you know, the traditional painted style, you know, obviously it looks different but it's reminiscent of, you know, how Shelton and Bill Brown and James Niehues' style.

AL: Yeah. Definitely. So did Northstar and Sierra at Tahoe, did they contact you or did you contact them to make their map?

AT: I sent out a mailing, just like a postcard or I can't remember what, to every ski area in the country just saying, you know, I'm doing these 3-D views, you know, are you interested. So they contacted me based on that. They just happened to be at a stage where they were looking to get something new done. I didn't send it out to every ski area probably just picked the top 100 and got a couple responses which is great.

AL: Great. So are you still hoping to make some more ski maps in the future?

AT: Absolutely. I mean a lot of them, you know, have their map and they just go back to James for updates but he's nearing retirement. I also am, you know, cognizant that it is his primary business.

AL: You don't want to step on his toes.

AT: I'm not eager to break in until he's ready to get out.

AL: Yeah I interviewed him too and he's actually in semi-retirement right now.

AT: Yep. In the next couple of months I'm going to get in touch with him and see if he's interested in seeing what I've been doing and whether he might be interested in passing off some of his clients to me but we'll see. I don't think there's too many people out there doing this stuff in the style that he does it.

AL: No, not really.

AT: But I consider myself doing it in his style.

AL: Cool. So what are your personal thoughts about the future of ski resort mapping, especially when James Niehues is done? Where do you think it's kind of going to go?

AT: Oh I think they're still going to need them. I mean we're gonna have fewer ski areas, is my guess. Global warming is not going to be kind to ski areas.

AL: *[laughter]* No unfortunately.

AT: But I think it's going to take you know, many decades before it has a *big* impact. *[unintelligible]* Fewer people will ski because there's gonna be fewer ski areas that can maintain the viable business with global warming. We'll see how it goes. But as long as there's major ski areas in business I think there's going to be a need for these sort of single view, overview maps, panorama maps of ski areas. I think they just really serve a function that no matter how many cutey ski apps that you put on a smart phone, even *[unintelligible]* ski maps they just don't do the same thing.

AL: No... Yeah.

AT: And, you know, to have one of these out on the slopes, a 10' x 6' board that people can just ski up to, take a look at it, and get a quick orientation for the mountain, it's just usually helpful.

AL: Yeah. Yeah definitely I hate taking my phone out on the mountain.

AT: It's a pain! The mechanics of it are painful but also, you know, it's a little screen, you're like trying to pan around, it's a pain!

AL: Yeah there's no way you can like, you can't see the whole resort in like one view because then the text is too small.

AT: Yep. I don't see these maps going away.

AL: I don't either.

AT: They really serve a function.

AL: Yeah definitely.

AT: When you want to get a preview of, you know, what's the slope like, what's it feel like, you know, going onto a website and getting a virtual ride down the slope, I mean that's all great but you're not going to do that when you're on the mountain.

AL: Yeah.

AT: People just seem to like them.

AL: Yeah.

AT: They like that artistic part of them. They like to see the whole mountain. You know, it always shocks me to see like, Breckenridge's map which is just so god awful.

AL: I know! *[laughter]* I know, I think it's horrible too.

AT: They have two painted maps! One by K.M. Mastin and one by James Niehues and they don't use them.

AL: I know.

AT: They use that horrible, I mean that's like the worst of computer-rendering.

AL: It's like satellite imagery draped over a DEM, it looks awful.

AT: With no attempt to do anything with it.

AL: No, yeah I don't know why they did that. I think some people like the accuracy of it because it's like, I mean it's imagery, so it's pretty accurate in terms of like where the trees are and stuff, but it's not just very aesthetically pleasing.

AT: Well it's also, you know, it's accurate but it's not as informative. People confuse accuracy with effective information transfer.

AL: Yeah. Yeah, I'm not a fan of it either. Well I think that's all I actually have to ask you.

End of Interview