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The Post-World War II Origin and Evolution of Mountain Snowshoes and Mountain Snowshoeing in North America

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ABSTRACT

The origins of mountain snowshoes can be traced back to the 1940s and 1950s, when small, maneuverable wooden frames were developed in the Adirondacks and Green Mountains. Fixed traction devices and forward hinge points originated in the Cascades in the late 1950s, enabling better access to steep terrain. The 1960s brought strong, lightweight aluminum-framed snowshoes from the Sierra Nevada. During this time, neoprene-coated nylon began to replace rawhide lacing and bindings in the Adirondacks, while neoprene-coated nylon decking was first used in the Cascades. Integrated plastic frame/decking snowshoes were a 1960s Rockies weight- and labor-saving innovation. From the Cascades in the early 1970s came hinged pivot bindings, with attached claws, that provided better traction and tracking. Integrated aluminum frame/decking snowshoes came from the Sierra Nevada in the 1980s. Fixed-pivot bindings and rear traction cleats for added maneuverability and stability originated in the Rockies and Sierra Nevada in the late 1980s and early 1990s. More substantial and user-friendly bindings also developed in the Green Mountains during this time. Further refined, integrated plastic frame/decking snowshoes from the Rockies came along in the 1990s. In the last decade, innovations from the Cascades and Rockies included integrated aluminum frame/traction snowshoes that further enhanced stability on steep slopes. Seventy years of research and development across North America has resulted in smaller, lighter, stronger, and more maneuverable mountain snowshoes. These innovations, and aggressive marketing initiated in the late 1980s, have helped snowshoeing become the fastest-growing winter sport in the U.S., with approximately five million participants.

Introduction

Snow sports are common leisure activities for Americans, especially those living in or adjacent to North America's mountains, where the snowpack is deepest and most persistent. As of winter 2009/2010, over thirty-three million Americans participated in some form of snow sports. The most popular of these sports (in ranked order) were alpine (i.e., downhill) skiing, snowboarding, cross country (i.e., Nordic) skiing, snowshoeing, freestyle skiing, and telemark skiing (Snowsports Industries America 2011, 9, 47–56). The popularity of winter sports has waxed and waned over time, depending on weather patterns as well as economics and politics at local to global scales. Leisure time became a reality for many Americans early in the twentieth century, with the development of labor-saving devices and shorter work weeks. While the Great Depression and World War II weakened this trend, the post-War years saw a dramatic increase in snow sports (and overall outdoor recreation activities) as Americans had more time, greater affluence, and better access to mountains (Kraus 2000, 26–27; Loverseed 2000, 57; Hudson 2004, 80; Weiss 2004, 318–319). The overall ascent in popularity of each of the mountain-centered snow sports is also intertwined with tremendous improvements in associated equipment over time.

Skis originated in northern Europe around 4,500 to 5,000 years ago. They entered North America in the nineteenth century with Scandinavian immigrants who settled in New England, the upper Midwest, the Rocky Mountains, the Pacific Northwest, and California's Sierra Nevada. These first skis were utilitarian, used for such activities as hunting and mail delivery. However, by the 1860s, skiers began racing and recreational ski clubs formed in California's Sierra Nevada. In the twentieth century, recreational skiing grew with the development of outing clubs, ski lifts and ski areas, an influx of high-quality European ski instructors, and the inclusion of skiing in the Winter Olympics beginning in 1924 (Berry 1982, 15–20; Allen 1993, 3–12, 30–40). Skiing—particularly alpine skiing—grew markedly in the years following World War II with returning ski troops, better equipment, improved rail and automobile access to ski areas, the creation of artificial snow, and increased standards of living allowing people to afford the sport (Needham 1987, 19, 44–49; Hudson 2004, 79).

Snowboarding, unlike skiing, is a relatively recent phenomenon and has been a snow sport since its inception. Snowboarding dates back to Sherman Poppen's creation of the surfboard-like "Snurfer" in the mid-1960s. By the late-1970s, the sport had diverged into two paths, led by pioneers Jake

Burton and Tom Sims. Burton, with a ski racing background, designed and manufactured snowboards and promoted snowboard racing. Sims used his skateboarding background to develop different styles of snowboards and competitions centered around freestyle snowboarding that included jumps and the half-pipe. Snowboarding evolved along these disparate tracks to become a culture that included numerous snowboard manufacturers, and clothing lines, videos, and magazines aimed at snowboarding. Snowboarding became an official part of the Winter Olympics in 1998 (Howe 1998, 5–55; Popovic 2009, 5–20).

Snowshoes likely originated in Eurasia between 2,000 and 6,000 years BP. More than 1,000 years ago they entered North America, where they evolved in a variety of shapes, sizes, and component types, first in Native American communities and later among Euro-Americans (Davidson 1937). Snowshoes, like skis, have utilitarian roots. Initially, hunters, trappers, surveyors, and utility workers, among others, used snowshoes as tools for traveling through, and working in, snow-covered areas. Eventually clubs formed, promoting snowshoeing as a winter sport. These included the Montreal Snowshoe Club which originated in the early 1840s, and the Appalachian Mountain Club, which held its first snowshoe outing in 1882. Snowshoeing continued as a sport in the late nineteenth and early twentieth centuries, as evidenced by snowshoe club-sponsored outings including hikes and races. However, in the pre-World War II years, snowshoeing did not enjoy the popularity of skiing, perhaps because of the activity's perceived lack of excitement. Additionally, traditional snowshoes were often large and heavy, making them cumbersome to use, especially for smaller individuals (Osgood and Hurley 1971, 16–21; Manning 1984, 24–33; Morrow 1988, 5–8). By World War II, most snowshoe clubs had faded away, and in the years immediately following the War, snowshoeing continued on a limited basis. Among the post-War snowshoers was a relatively small number of hardy individuals who snowshoed solely in mountains. Often these were climbers looking for ways to better access mountains in winter. Others sought the peace and quiet of little-populated mountains. As mountain snowshoeing pioneer Gene Prater (1974, viii) so aptly stated:

> Unchanged is the attraction of the winter outdoors, especially to those in an urban environment. There seems to be some part of one's soul that responds to the snowy woods and mountains. Perhaps each of us silently longs for a place that is timeless, that is lovely, to which we can return and

> touch and know it will be there, although everything else in our cities, jobs, and complicated society is changing.

Interest in mountain snowshoeing initially grew very slowly in the post-World War II years. Further, recreational snowshoers found—as had earlier, more utilitarian users—that commercially available snowshoes, designed mostly for lowlands, were not ideal for mountain use (Scudder 1884, 314–323). Did this realization, combined with increased interest in mountain recreation in the post-War years, set in motion a modification of lowland snowshoes or the development of new snowshoes to meet the demands of North America's mountains? Did technological innovation in snowshoes, as in other products, occur in particular places at particular times as inventors and makers came in contact with willing consumers? Finally, did different regions, because of their particular geographical characteristics, foster unique snowshoe designs? Snowshoe makers (and brothers) Gene and William "Bill" Prater alluded to such regional differences by coining the term "western" and "western mountain" snowshoes, respectively, in reference to small, post-World War II snowshoes used primarily in western mountains (Prater 1980a, 16). William "Bill" Osgood and Gene Prater went so far as to author articles titled "Snowshoes East" and "Snowshoes West," respectively, to refer to such differences in snowshoes and snowshoeing practices in North America (Osgood and Prater 1981, 37–40; Prater 1981, 40–46). However, as Gene Prater noted (Prater and Felkley 1997, 35):

> I have used the word "Western" as a design or type, because these snowshoes are so different from wood-frame laced models. Years ago the first Western snowshoe sold throughout the Snow Belt was manufactured in Washington State. But the name doesn't fit geographically any more. The former Washington-made Western is now made in Wisconsin, with other Westerns made in California, Utah, Colorado, and as far east as Vermont, with various others in between.

One may argue that the development of snowshoes suited to mountain use occurred in different places across North America because of different conditions present there, and that, over time, the resulting innovations have diffused throughout the continent; therefore, the western or western mountain snowshoe is really a "mountain snowshoe."

In the following pages, I use library research, personal interviews, and field observations to examine the post-World War II origins and evolution of mountain snowshoes, and the associated activity of mountain snowshoe-

ing across North America. In this analysis, I pay particular attention to the physical geography (especially snowpack, topography, and vegetation) and human geography (including traditional designs, snowshoer travel patterns, snowshoer load, material availability, human ingenuity, and marketing) contexts within the larger setting of snow sports in which these origins and evolution occurred.

Traditional Snowshoe Components and Styles

Traditional snowshoes consisted of frames, webbing, hinge points, and bindings. They were primarily designed for, and used in, gentle terrain (Figure 1).

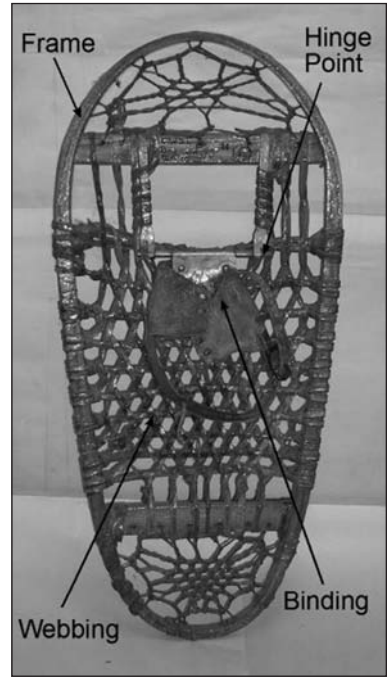

Figure 1.—A pre-1945 bearpaw snowshoe and its components. This snowshoe was made by the C.A. Lund Company and included Olney Burgess' rotating pivot hinge point.

Frames are the foundations upon which the other snowshoe components reside. White ash (*Fraxinus americana*) of eastern North American deciduous forests was the desired traditional snowshoe frame material because of its ease of bending (when steamed), high strength, flexibility, and overall durability. Most traditional snowshoe makers were located east of the Rockies, presumably because white ash did not grow naturally in the West (Burns and Honkala 1990, 333–338; Zwosta 1998, 14–15). Wood frames were ideal because they could be built by craftsmen with basic woodworking tools from locally obtained materials. The down sides were the difficulties of obtaining high-quality wood, the needs for regular maintenance, and the potential for breakage during use.

Four basic styles of snowshoe frames—bearpaws, Yukons, Ojibwas, and beavertails—were commonly available as of 1940.

The choice of particular frame styles and their various sizes depended on snow, topography, vegetation, snowshoer "load," and snowshoer travel patterns. Short, wide, and flat-toed bearpaws were useful for kicking

steps on direct ascents and negotiating brushy settings where frequent turns were necessary; however, their width hampered sidehill traverses. Yukons were designed for deep powder snow in unforested country and were acceptable for switchback traverses. Their long, upturned toes made them a poor choice for direct ascents. A pointed, upturned toe helped the Ojibwas (or Cree) cut through deep snow and thick brush but, like the Yukons, their overall size limited maneuverability. Beavertails (also known as Maine, Michigan, and Huron) had a minimal toe upturn that allowed for kick-stepping direct ascents. The length and width enhanced their functionality in deep powder snow but limited their utility in traversing steep slopes (Osgood and Hurley 1971, 31–34; Prater 1980a, 14–20).

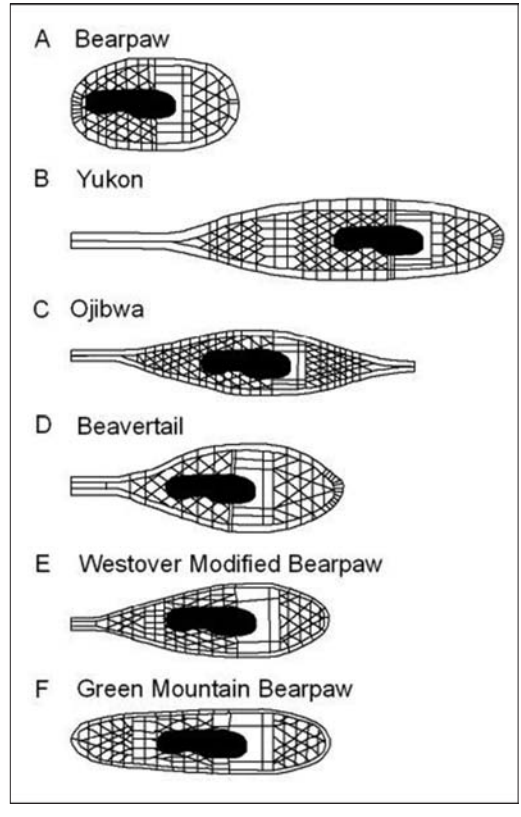

Figure 2.—Snowshoe frame designs prior to (A–D), and following (E–F), the 1940s.

Webbing, combined with the frame, provided flotation and traction in traditional snowshoes. The tightness or closeness of the webbing weave affected flotation depending on the size of the snowshoer and the characteristics of the snow (Osgood and Hurley 1971, 42).

Rawhide webbing laced around the frame provided modest traction on early snowshoes, especially in soft snow. However, snowshoers needed to stomp the webbing into firm snow or steep slopes to maintain footing (Prater 1957a, 4). Even then, according to Scudder (1884, 318), early snowshoers bemoaned slippage:

> The only way to scale these portions of our way erect was to plant the [snow] shoe flat-footed on the snow, and trust to luck that it would not slip back when the other foot essayed a forward step. Many a fall did we have, and many ignominious backward slide, to the amusement of those behind.

Wood snowshoes laced with rawhide webbing held up well to abrasion in the sub-freezing temperatures that characterized winters east of the Rockies; however, the wet snows of more marine-influenced areas saturated the rawhide, causing it to lose strength and become less resistant to abrasion and more susceptible to stretching. To prevent this, rawhide webbing (and wood frames) needed regular varnish coatings (Osgood and Hurley 1971, 46; Prater 1980, 20).

The *hinge point* is where bindings attach and pivot from the main part of the snowshoe. This point dictates snowshoe balance. Prior to 1940, two snowshoe *hinges* were available—rawhide toe cord and rotating pivot. The more traditional rawhide toe cord was attached to the side frames. The binding, in turn, was attached to the toe cord via leather straps. The floppy nature of the binding/rawhide toe cord attachment made them less than ideal for maneuverability; i.e., the snowshoe did not "track" (directly follow) the boot, therefore making it difficult to traverse slopes (Zwosta 1998, 14–15). The rotating pivot consisted of an axle fixed to the snowshoe frame around which a sleeve, attached to the binding, rotated. Olney Burgess, an early employee of Tubbs Snowshoes, patented the rotating pivot design in 1927. It was subsequently used on U.S. military bearpaws, providing a largely friction-free hinge that minimized sideways movement of the boot. However, this design was heavy and, because the axle was integrated into the frame, the binding had little "roll," making it difficult for a snowshoer to "edge" into a slope on traverses.

Bindings are designed to keep snowshoes attached to one's feet and to keep snowshoes moving in the direction of travel. Traditional snowshoe bindings were constructed of a wide piece of leather that laterally encased the front of the foot. A middle strap and a heel strap often held this piece of leather to the foot. One or more of these straps attached to the rawhide toe cord or sleeve of the rotating pivot. These leather bindings were marginally adequate on flat lands, in drier snows, and even in mountain ascents. However, the leather would become "soaked, slippery, and as pliable as a wet noodle" in wet snow, such as that characterizing more marine settings.

Further, because they lacked a front toe strap, boots tended to slide forward and come out of the bindings on mountain descents (Prater 1980a, 42).

The 1940s and '50s: New Frames and Increased Maneuverability

The years following World War II were a time of low but slowly growing interest in mountain snowshoeing, from utilitarian as well as recreational perspectives. During the mid-1940s, three companies were the primary manufacturers of snowshoes in the United States: C.A. Lund, of Hastings, Minnesota; Snocraft, of Norway, Maine; and American Fork and Hoe Company, of Wallingford, Vermont. The first snowshoe mountaineering articles of the post-World War II period appeared in *Summit* magazine in 1957. These articles illustrate snowshoes and snowshoeing techniques that are very different from today's (Prater 1957a; Prater 1957b, 8–9, 20). With increased interest came a demand for more-maneuverable snowshoes that could enable snowshoers to negotiate terrain with a variety of topographic, snow, and vegetation conditions. Increased maneuverability was achieved by decreasing overall snowshoe size and weight, creating more robust bindings, and enhancing traction.

Northern Appalachian snowshoe makers led the way in developing smaller, more maneuverable snowshoes. Floyd Westover, a cottage industry-scale snowshoe builder from Gloversville, New York, in the foothills of the Adirondacks, began building white ash snowshoe frames in the early 1940s that combined the positive maneuverability traits of the bearpaw with those of the beavertail. The resulting twelve- by thirty-four inch Westover modified bearpaw had a short tail and a narrower design than standard bearpaws. The short tail helped the snowshoe track better in the direction of travel, an important consideration given the loose nature of early bindings. The narrower design also allowed snowshoers to better traverse steep slopes. These, like other traditional snowshoes of the Northern Appalachians, had little to no toe upturn, making them ideal for step-kicking up the crusted or icy snow-covered slopes common there. This design may have existed as early as the 1870s, but Floyd Westover popularized the style (Bearce 2007). The Westover-modified bearpaw frame reappeared again in the 1970s and 1980s as the preferred style of several mountain snowshoe builders in the Western Cordillera.

The second Northern Appalachian-inspired frame style to be refined during this period was the Green Mountain modified bearpaw. The Green

Mountain modified bearpaw style may have existed as early as 1910 in upstate New York (Bearce 2007). However, the style was refined and made popular by the efforts of prominent snowshoe company Vermont Tubbs and its owner Harold Underwood in the mid- to late 1950s. The resulting 10- by 36-inch design, with an upturned toe and a rounded bearpaw tail, was highly maneuverable in steep, wooded terrain yet provided adequate flotation. The Green Mountain modified bearpaw became one of the most popular of Vermont Tubbs' wooden-frame snowshoes, and the most common frame shape of contemporary mountain snowshoes (Prater 1957b).

Early mountain-inspired snowshoe innovations also came from the Western Cordillera. In the 1950s, Bill and Gene Prater, brothers from the Ellensburg, Washington, area, farmed in the summers and snowshoed in the nearby Cascades in the winter months (Prater 1998, 34). Following the end of World War II, military snowshoes were readily and cheaply available in surplus stores. Unfortunately, the select U.S. Army troops who received specialized training in mountain warfare found that the Yukons (as well as the bearpaws) were "utterly useless" on steep, forested mountain slopes (Harper 1943, 173–175). As avid snowshoers, mountain climbers, and inveterate tinkerers, and lacking much money, the Praters sought to successfully use war-surplus snowshoes in mountain settings. They focused on the Yukons because the flat toes of the bearpaws were difficult to lift out of the deep, heavy, marine-influenced snow known regionally as "Cascade concrete." Gene Prater first shortened the Yukon tails so they took on a Westover-modified bearpaw appearance, and thinned, steamed, and bent the tails to resemble Green Mountain modified bearpaws. He also replaced the high, but gently bent, Yukon toes with shorter, more abrupt aluminum toes that worked adequately on kick-stepping ascents and kept one from tripping on the descents (Prater 1969, 21–22). The Praters discovered that a more forward hinge point, like a snowshoe with a shorter toe, put weight forward, thus providing more traction—a key issue on steep slopes. Other early methods of improving traction involved wrapping rawhide or small-diameter rope around the frames, coating the frame bottoms with a mixture of rubber cement and sawdust, inserting screws into the frame bottoms, and attaching angle aluminum to the frame bottoms (Prater 1957a, 2). Bill Prater was also instrumental in developing a hinged-rod binding system that replaced the traditional rawhide toe cord. The hinge rod was more durable than the toe cord, and when securely fastened to a binding, greatly improved a snowshoe's tracking. Prater's hinge-rod system was an improvement over

Burgess' earlier rotating pivot design because it was attached to the frame by a leather thong rather than being integrated into the frame. Therefore, it provided the necessary roll for mountain snowshoers to effectively edge into, and traverse, steep slopes (Prater 1957a, 3). These Cascade Range-inspired hinge point alterations, traction devices, and bindings inspired many of today's snowshoe designs.

The 1960s: New Materials

The 1960s brought slowly increasing interest in recreational mountain snowshoeing. This reflected the larger societal movement toward increased outdoor recreation in general in the 1960s. The appearance of the first snowshoe guidebook (aimed at Washington state's Cascade Range and Olympic Mountains) late in the 1960s illustrates this increased interest (Prater 1969). The 1960s were a period of major mountain-snowshoe development with improvements in maneuverability and durability associated with the incorporation of new, lightweight materials into snowshoe frames, webbing, and bindings. The new materials and their incorporation into snowshoes reflected the larger picture of burgeoning high-technology industries in the 1960s. As a result, this also represented the first step in the movement away from traditional snowshoe materials—wood, rawhide, and tanned leather. Snowshoe innovators of the 1960s came from the Adirondacks and Green Mountains in the East, and the Sierra Nevada and Rocky Mountains in the West. Two new, albeit small, snowshoe manufacturers originated during this period. However, Vermont Tubbs, Snocraft, and Lund remained the main manufacturers of snowshoes (Prater 1998, 34).

By the very early 1960s, Floyd Westover had replaced the rawhide of webbing and the tanned leather of bindings with neoprene-coated nylon (Norton 1963, 17). Neoprene-coated nylon was better known for its use in Mercury-era space suits but was found to be advantageous for snowshoes because it was maintenance-free, waterproof, strong, and relatively abrasion-resistant (Bellis n.d.). The latter point was especially important on rocky summits, characteristic of the Northern Appalachians, that could quickly abrade rawhide webbing. Other snowshoe makers soon followed Westover, including Iverson Snowshoes, of Michigan's Upper Peninsula; and Vermont Tubbs. In addition to the aforementioned advantages, Richard Havlick made the switch to neoprene-coated nylon because of difficulties obtaining good-quality rawhide. Utilitarian snowshoe users (e.g., foresters, utility linemen, and trappers) appreciated the improvements brought by neoprene-coated

nylon. However, recreational snowshoers were less impressed with the new product because it was a move away from the traditional roots (and looks) of snowshoeing.

Aluminum-framed snowshoes also made their debut in the early 1960s. John Butler, then of the San Diego, California, area, learned to build aluminum-framed snowshoes while he was an Explorer scout. He and the group's leaders chose aluminum because of the ready availability of scrap aluminum from the nearby aircraft industry and because none of the scouts or leaders had the skills to steam and bend wood. Aluminum has the advantage of being strong, lightweight, and, like neoprene-coated nylon, literally maintenance free. By 1968, Butler had moved to Nevada City, in the Sierra Nevada Range, where he and his wife Susan manufactured and sold Green Mountain modified, bearpaw-shaped, tubular aluminum-framed snow-shoes out of their garage, under the name Black Forest Enterprises.

They followed the trends of the times by using synthetics for webbing (epoxy-coated nylon cord) and bindings (neoprene-coated nylon). Black Forest was also the first commercial snowshoe to mount, as standard equipment, serrated angle aluminum to the underside of the snowshoe for traction purposes. Reflecting the small but growing interest in mountain recreation, most of the sales of this mail-order-based cottage industry were to utility companies, and secondarily to mountain recreationalists (Butler and Butler n.d.).

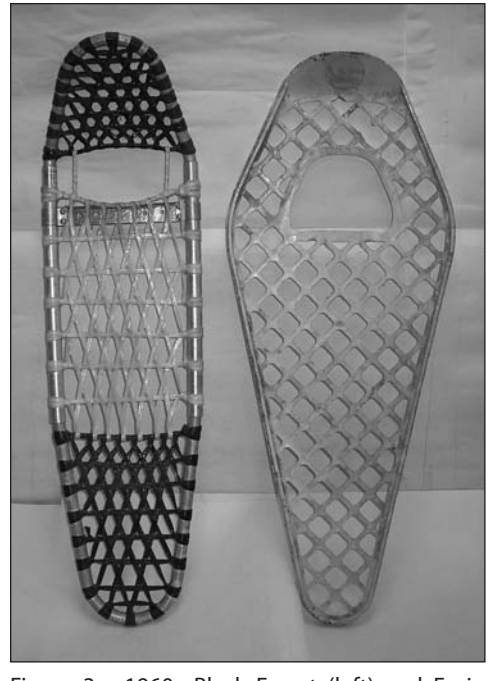

Figure 3.—1960s Black Forest (left) and Ernie Snyder's "Snowtreads" (right) snowshoes. Note the tubular aluminum Green Mountain bearpaw frame and synthetic webbing of the Black Forest model. Note the integrated plastic frame-traction of the Snowtreads.

Plastic snowshoes were the next innovation in the mountain snowshoe world. These were created by Ernest "Ernie"

Snyder of Boulder County, Colorado, fresh out of college with a degree in Industrial Design and a background in plastic injection molding. These "Snowtreads" in Green Mountain modified bearpaw designs were also the first commercial snowshoes with integrated frame and decking, thus reducing labor costs during manufacture. Snyder chose polypropylene for these snowshoes because of his background, and because of its lightweight, maintenance-free, and rodent-proof nature. The "greasy" polypropylene frame and decking also prevented snow from sticking. A nylon webbing binding attached to a polypropylene hinge that was integrated into the frame. These inexpensive snowshoes were marketed by Sportsmen Products of Boulder, Colorado, to outdoor workers, recreational snowshoers, and snowmobilers.

1970s: Putting It all Together in Smaller Packages

Winter sports participation increased in the 1970s. Alpine skiing was the most popular of the non-motorized winter sports, but Nordic skiing was gaining in popularity. While snowshoeing lagged well behind alpine and Nordic skiing, snowshoe sales rose during the 1970s. Baird Morgan, then-owner of Vermont Tubbs, recalls selling approximately a thousand pairs of snowshoes in a typical year in the 1960s, while selling more than fifty thousand pairs in 1972. Native American tribes in Quebec (primarily Hurons) were likely the largest manufacturers of snowshoes throughout the 1970s. Vermont Tubbs, Snocraft, and Iverson were the main U.S. snowshoe manufacturers during this time. Vermont Tubbs helped expand the market by aggressively marketing snowshoes to recreationalists via sporting goods and ski shops. The products of a new company, Sherpa, came on the scene beginning in the early 1970s and were also sold in recreation-oriented stores such as Recreational Equipment Incorporated (REI) (Osgood and Hurley 1971, 16). At least four books focused entirely on snowshoeing were published early in this period (Osgood and Hurley 1971, Prater 1974, Hollatz 1975, and Wolfram 1977), and numerous articles in trade and other journals, and portions of books, addressed snowshoeing in mountains. It was also during this period that snowshoe advertisements started appearing in outdoor-oriented magazines such as *Summit* and *Backpacker*.

The 1970s were a time of continued evolution in, and use of, mountain snowshoes. Traditional wood snowshoe makers such as Vermont Tubbs, Snocraft, Faber, Iverson, Heilman, and various Native American groups built wooden snowshoes, many of which were appropriate for mountain

use. So-called "woodies" made up most of the snowshoes evaluated in *Backpacker* magazine in 1975. One of the snowshoes evaluated, the Gene Prater-designed, Vermont Tubbs-marketed, 10- by 36-inch, Green Mountain modified bearpaw-shaped "Cascade" model, was created specifically for mountains.

This, and Prater's subsequent aluminum snowshoes (see below), were characterized by an "extreme forward location" of the hinge point that was superior in traction and maneuverability. The binding for the Cascade model was designed by Bill Prater, who refined and patented the hinged-rod system that he began to develop in the 1950s. Neoprene-coated nylon encased the foot rather than leather. Attached to the binding was a V-shaped, serrated aluminum "snow-claw" that had traction in two directions and hinged with the binding with each step. The binding was the first commercial product of Bill and Barb Prater's new company, Sherpa Design, Inc.

Another 1970s wooden mountain-snowshoe builder was Carl Heilman of Brant Lake, New York, on the southern edge of the Adirondacks. Heilman differed from other wood snowshoe makers in that he designed, custom built, and sold small and lightweight (8- by 26-inch to 9- by 30-inch) wooden snowshoes for mountain travel and racing, beginning in the mid-1970s. He built his Green Mountain modified bearpaw-shaped snowshoes from hand-split white ash, for people who still wanted wood but were looking for small, lightweight, and highly maneuverable snowshoes. Somewhat breaking from tradition, Heilman used neoprene-coated nylon rather than rawhide for snowshoe webbing. He also

Figure 4.—1970s Sherpa (left) and Heilman (right) snowshoes. Note the synthetic decking and webbing of the Sherpa, and the small wooden frames of the Heilman.

experimented with polyurethane lace and plastic-coated wire as a means to decrease overall snowshoe weight. Snowshoe trips in the steeper portions of the Northern Appalachians benefitted from aggressive traction devices. This is especially true considering the tendency for trails to directly ascend, rather than switchback up, Northern Appalachian slopes, and was further magnified by the thick glaze- and rime ice-coated summits common in these mountains. Heilman incorporated aggressive "instep crampons"—five- or six-point crampons approximately the size of a person's instep—that could be attached to the bottoms of snowshoe bindings.

Other small companies attempted to grow market share by building and selling aluminum or plastic snowshoes during the 1970s. Advertisements in *Backpacker* and *Summit* magazines reveal that these included Black Forest and Snowtreads as well as Sherpa and Prater. Following the development of the hinged rod binding, Bill Prater created a Green Mountain modified bearpaw-shaped, tubular aluminum-framed snowshoe. Because wet Cascade snows stuck to bare aluminum, frames were initially coated with enamel paint and later anodized. These "Sherpa Tubbs" and, by 1974, "Sherpa" snowshoes included the hinged-rod binding with claw and were the first commercially available snowshoes to have solid, neoprene-coated nylon decking attached to the frame with neoprene-coated nylon webbing. Bill and Gene Prater had first experimented with leather decking in the 1950s and neoprene-coated nylon decking in the mid- to late-1960s as a way to decrease labor and better shed the "Cascade concrete" that accumulated atop snowshoe webbing. A negative aspect of solid decking is that it lacks the traction afforded by webbing. Solid decked snowshoes therefore required traction devices, especially if they were to be used on steep slopes. With four sizes of Sherpa snowshoes marketed, it was the smaller sizes (8- by 25-inch and 9- by 30-inch) that were more popular for mountain snowshoeing. While Eastern retailers were slow to accept the Sherpa's nontraditional look, the revolutionary snowshoes became quite popular in Western North America, especially with serious mountaineers. In recognition of their importance to the development of mountain snowshoeing, *Outside* magazine named Sherpa snowshoes the most influential outdoor gear of 1972 (Broudy and Freeman 2012).

Late 1970s and '80s: More Synthetics and Integration

The late 1970s and 1980s were a period of little growth in snowshoe sales and use. A combination of the increased popularity of cross country skiing, a poor U.S. economy, and a series of warm, dry winters dampened interest in snowshoeing. However, this was a time of advances in the use of synthetic materials, and a time of frame-decking and frame-decking-traction integration in mountain snowshoes. It was also the time that Redfeather joined Vermont Tubbs and Sherpa as the premier mountain snowshoe brands.

In the late 1970s, Gene Prater began custom building and selling "Prater" snowshoes from his Ellensburg farm. These small, tubular aluminum-framed snowshoes differed from Black Forest and Sherpas in having a Westover modified bearpaw shape in sizes ranging from 7.5 by 21 inches to 8.5 by 37 inches. The Westover modified shape permitted one-piece construction that meant fewer weak spots that could break under pressure, and the associated tail helped the snowshoe track better. A fixed traction device provided traction whenever the snowshoe was on the ground, regardless of the position of one's boot.

Figure 5.—Late 1970s and 1980s Prater "Ellensburg" (left), Tubbs "Alum-A-Shoe" (middle), Polar Equipment Company's "Polarpaws" (right). Note the Westover-modified frame on the Praters, the aluminum I-beam frame, Hypalon decking, and plastic-coated wire lacing on the Tubbs, and integrated sheet-aluminum frame-decking-traction of the Polarpaws.

In the late 1970s, Vermont Tubbs, headed by owner Baird Morgan's innovations, joined the ranks of the aluminum-frame snowshoe makers after manufacturing exclusively wood-framed snowshoes since 1907 (Anderson 2005, 3). The shift to aluminum frames was motivated by the difficulty of consistently finding high-quality white ash. Poor-quality wood led to increased breakage, hence waste, in the process of bending snowshoes. At that time, waste was at least fifty percent due to ash that broke instead of flexing in the bending process. It was this wastage and the seasonal nature of the business that prompted snowshoe companies to build snowshoe "furniture" in their off-seasons. Vermont Tubbs' shift to aluminum I-beam, rather than tubing, resulted in a snowshoe that was very different from the Black Forest or Sherpa brands. The I-beam was strong and protected webbing as it went through, rather than around, the frame. The integrated frame-traction resulting from the "I" enhanced traction, especially when traversing steep slopes. Further traction was provided by a U-shaped aluminum traction device located beneath the instep, and by plastic-coated wire webbing underfoot. Lightweight, yet strong, Hypalon, more commonly known for its use in inflatable boats, roofing, and reservoir liners, was used for decking on the heels and toes. The resulting 10- by 36-inch "Alum-A-Shoe" was later downsized to become the more popular 9- by 30-inch "Snow Spyder."

Snowshoe evolution took another step forward with the first attempts to integrate frame, decking, and traction in the early 1980s. Retired metallurgist Robert Wallace designed, manufactured, and sold "Polarpaws" as the first product of his newly formed Polar Equipment Company that he operated from his home in California's south San Francisco Bay area. Polarpaws consisted of a single piece of stamped and shaped sheet aluminum with traction integrated into the downturned, serrated edge of the aluminum frame-decking. Additional traction was provided by an aggressive steel crampon that hinged with stainless steel and aluminum bindings. These all-metal snowshoes required less labor to build, and were small (6.5 by 20 inches to 8 by 28 inches), lightweight, low maintenance, and the most aggressive snowshoes of their day for climbing steep mountain slopes.

Snowshoe racing drove further mountain snowshoe innovations. Bill Perkins, inspired by the snowshoe portions of the Mt. Taylor, New Mexico, Quadrathon and the Mountain Man Triathalon in Avon, Colorado, set out to create lighter, more-maneuverable snowshoes appropriate for mountain racing. Beginning in fall 1985, Perkins rebuilt the Sherpas he wore in those races by reducing the amount of lacing, replacing the neoprene-coated nylon

decking with lightweight Hypalon, and replacing the bindings with a directly mounted running shoe. By late summer 1988, he had incorporated the above changes into 8- by 25-inch to 10- by 34-inch Westover modified bearpaw-shaped, tubular-aluminum-frames. The resulting "Redfeather" snowshoes had sharply upward-bent toes that worked well in the deep powder of the Rockies. The frame was squeezed together and covered with a single piece of Hypalon deck to create little "foot trampolines" with much give to them, making snowshoeing easier on one's legs and feet. Perkins also developed a new type of binding hinge from a reinforced Nitrile band. This strong, tensioned band flexed rather than rotated with the pressure of the foot. When the foot was lifted, the band flexed back, causing the snowshoe to return to a near-horizontal position. This was an ideal hinge for snowshoe runners because it reduced the potential for catching a snowshoe on an obstruction. In addition to a stainless-steel traction device mounted just forward of the ball of the foot, Perkins was the first to add a rear claw for additional stability. Perkins and Redfeather are also notable in being the first to aggressively market snowshoes through large ski resorts and associated towns—in his case, Aspen, Colorado—beginning in the late 1980s.

1990 Through Present: Bindings, More Integration, and Marketing

The 1990s were a time of tremendous growth in snowshoeing and snowshoe sales. According to the National Sporting Goods Association, those who snowshoed at least once in a given year increased from approximately 444,000 in 1992 to over one million in 2000. At this time, snowshoeing was deemed the fastest-growing winter sport (Wolkomir 2000, 91). The growth was driven by at least three factors: (1) four key manufacturers—Tubbs and Redfeather, as well as newcomers Atlas and MSR—led the way with innovations that further refined the smaller, more-maneuverable, and more-aggressive mountain snowshoes; (2) the expiration of Bill Prater's hinged claw patent opened the door for new snowshoe makers, hence new innovators, to enter the market; and (3) all four of the key snowshoe companies—especially Tubbs and Atlas—aggressively marketed their snowshoes, therefore expanding the market at a time of explosive outdoor recreation growth.

Ed Kiniry purchased Tubbs in 1988. At that time, he didn't think society viewed snowshoeing as an "activity." He determined that bindings and marketing were the issues holding back the growth of snowshoeing as an activity. Despite the work of Bill Prater in the 1950s–'70s, bindings were

still the weak link in mountain snowshoe design. Kiniry and his Tubbs colleagues designed an integrated binding-traction claw to solve this problem. The resulting lightweight, bicycle toe-cliplike binding with stiff side wings provided ample lateral support, ensuring that the tubular aluminum-framed snowshoe tail tracked the boot heel.

Tubbs' General Manager Kathy Murphy (Koornick 2002), who took care of the marketing angle, said

> The mood at the end of the '80s was ripe for new recreational activities. Before that, snowshoeing was a utilitarian-based activity practiced by mostly technical users. The ski and cross-country business was strong at that time, and people were thinking about recreational fitness. The Olympics in the '80s also raised awareness of winter sports in the United States. We took the image of a bearded snowshoer and reversed it with new technology such as lightweight metal frames and comfortable bindings.

Murphy effectively promoted the message of snowshoeing and Tubbs' new snowshoe innovations to the public in three ways: awareness creation, events, and access. Tubbs created awareness of their products via public and media relations, especially in magazine articles. They also hosted fun events at high-profile mountain resorts, where consumers had the opportunity to try out snowshoes risk- and cost-free. Through awareness-creation and events, Tubbs was the first company to design snowshoes specifically for women and kids. These efforts capitalized on the increased rate of women participating in outdoor activities, beginning in the 1990s. Finally, Tubbs located and established access for snowshoers on public and private lands, and provided maps and instructions to locate these places. Each of these actions helped to greatly expand the snowshoe market.

Newcomers to the snowshoe scene—Perry Klebahn and James "Jim" Klingbeil—developed what became "Atlas" snowshoes in the early 1990s in California's San Francisco Bay area. Klebahn chose to invent an improved snowshoe as his culminating project in the Product Design graduate program at Stanford University after using snowshoes that were very unstable, especially when descending. The resulting Green Mountain modified bearpaw-shaped, aluminum-framed and synthetic-decked, Atlas snowshoes had a patented soft hinge or spring-loaded hinge system (like Redfeather's live hinge), and a patented rear traction cleat in addition to a front cleat. This rear cleat added several lineal inches of traction beneath the boot heel, thereby improving control, especially on descents. Klebahn also discovered,

as had Ed Kiniry at Tubbs, that there was essentially no retail interest for snowshoes in the early 1990s. Retailers would tell him, "We sell snowshoes to put above fireplaces," so Klebahn had to sell consumers and retailers on the advantages of Atlas snowshoes. Klebahn sponsored events, albeit less conventional, to build demand for snowshoes and snowshoeing, including moonlight snowshoe walks and ice cream socials at mountain resorts throughout the West. He was also instrumental in helping establish the first snowshoe park at Beaver Creek, Colorado.

Figure 6.—1990s and early 2000s MSR "Denali" (left) and "Lightning" (right) models. Note the plastic integrated frame-decking of the Denali and the band aluminum frame and heel ascenders of the Lightning.

Despite the advances in mountain snowshoe designs in the 1990s, a need existed for a relatively inexpensive yet high-quality snowshoe that had further enhanced stability, especially on steep slopes. Bill Forrest, then of Denver, Colorado, used his years of experience in developing technical mountain climbing equipment to design a Green Mountain modified bearpaw-shaped snowshoe composed of injection-molded plastic with integrated frame-decking. This plastic snowshoe improved on Ernie Snyder's 1960s Snowtreads by being smaller (8 by 22 inches), lighter, and stronger. Forrest's snowshoe could be manufactured less expensively than those composed of aluminum tubing and synthetic decking. Traction necessary for controlled descents and traverses in steep terrain was provided by a rotating, steel crampon and traction bars along the snowshoe sides and horizontal ribs in the plastic frame/deck. Older snowshoers would especially benefit from this design, an important point considering the changing demographic of outdoor recreationalists. Forrest sold the design to Seattle-based Mountain Safety Research (MSR), a com-

pany known for manufacturing innovative and high-quality backpacking equipment, who marketed this first snowshoe as the Denali. In addition to the plastic and traction-intensive design, this model was innovative in being size-adjustable–i.e., tails (4 and 8 inches long) that could be quickly attached to the frame therefore providing adjustments for snow, topography, vegetation cover, and snowshoer load. The Denali was also the first snowshoe to have heel ascenders that lifted the heels of one's boots while ascending, thus making it easier to climb steep slopes. With the success of the 1990s Denali, MSR asked Forrest to design a high-performance, lightweight snowshoe with yet more traction. Forrest's resulting 2004 MSR "Lightning," like the Polarpaws of the 1980s, was an integrated frame-traction snowshoe constructed of aluminum band and synthetic decking. The Lightning doubled the traction of the Denali and resulted in a snowshoe that had abundant traction for ascending, traversing, and descending steep terrain.

Conclusions

Snowshoes have been in North America for at least a thousand years. The particular style referred to as "mountain snowshoes" originated in or near North America's mountains beginning in the 1940s and 1950s through the modification of traditional snowshoe designs and the creation of new designs. Mountain snowshoes have evolved through the present, with innovations coming from various parts of the Eastern and Western Cordillera.

Once distinguishable by region, mountain snowshoe models are now similar from coast to coast. Innovation was as much a product of innovator's abilities and material availability as it was a product of snow, topography, and vegetation patterns. Snowshoe makers, while designing their snowshoes *in* particular regions, did not typically design their snowshoes specifically *for* particular regions. This was especially true of the Green Mountain modified bearpaw frame design that seemed to work well everywhere.

Mountain winter sports grew in the years following the end of World War II with increases in leisure time, disposable income, and access to mountains. Snowshoeing has mirrored this trend, albeit more slowly than alpine and nordic skiing, and snowboarding until recent years. During the period of analysis, snowshoeing has evolved from a predominantly utilitarian activity practiced primarily by adult males to a mostly recreational activity involving men, women, and children. Recreational snowshoeing now ranges from snow-based walking to snowshoe racing and mountaineering. As such, snowshoeing may be a solitary or group activity. Competition

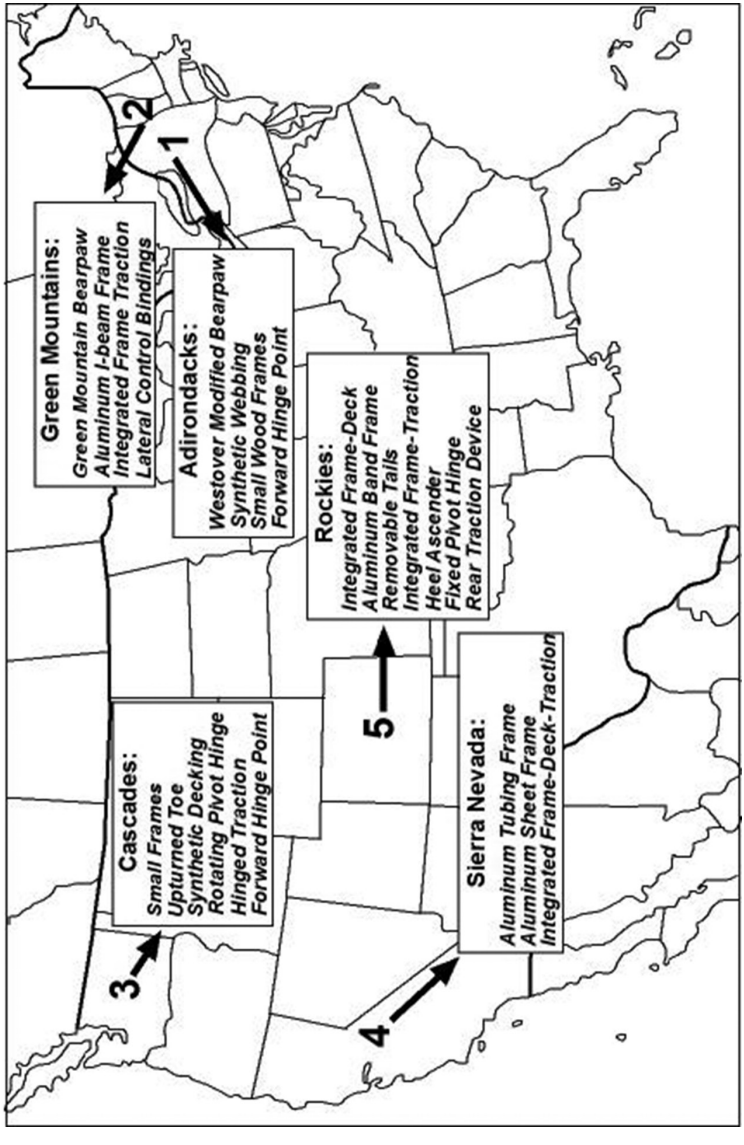

Figure 7.—Geographic origins of the various mountain snowshoe components. Numbers refer to locations of key snowshoe builders: (1) Adirondacks—Floyd Westover, Richard Havlick, and Carl Heilman; (2) Green Mountains—Harold Underwood, Baird Morgan, and Ed Kiniry; (3) Cascade Range—Bill Prater and Gene Prater; (4) Sierra Nevada—John Butler, Bob Wallace, and Perry Klebahn; and (5) Rockies—Ernie Snyder and Bill Forrest.

Table 1. Evolution of mountain snowshoes in North America. Dates reflect decade of first commercial use.

	1940	1950	1960	1970	1980	1990	2000
Frame Shape[a]	WMB	GMB					
Frame Composition[b]	W		I-MP Al tube	Al I-beam	Al sheet		Al band
Webbing[c]	RH		N-CN, ECN	PCW	P		
Decking[d]			I-MP	N-CN	Al		
Hinge Point[e]	RP			RPm		FP	
Binding[f]		LHL	LN-CN			SLN	
Traction Device[g]		FFB		HC, IF		RFC	

a. WMB = Westover Modified Bearpaw; GMB = Green Mountain Bearpaw
b. W = wood; I-MP = injection-molded plastic; Al tube = aluminum tubing; Al I-beam = aluminum I-beam; Al sheet = aluminum sheet; Al band = aluminum band
c. RH= rawhide; N-CN = neoprene-coated nylon; ECN = epoxy coated nylon; PCW = plastic-coated wire; P = polyurethane
d. I-MP = injection-molded plastic; N-CN =neoprene-coated nylon ; Al = aluminum
e. RP = rotating pivot; Rpm=rotating pivot modified; FP = fixed pivot
f. LHL = large heavy leather; LN-CN = large neoprene-coated nylon; SLS = substantial large nylon
g. FFB = front fixed bar; HC = hinged claw ; IF = integrated frame; RFC = rear fixed cleat

among domestic manufacturers, and more recently, overseas manufacture has made snowshoes more affordable and available across a broad range of income levels. Only Tubbs remains from the big three of the 1940s, 1950s, and 1960s, and its snowshoes of today are very different from those of the earlier decades. Given the changes that have occurred in snowshoe design over the past 60 years, and the rapid technological changes that we see today, it is likely that mountain snowshoes will continue to evolve over the next century. As Gene Prater said (1974, 11):

> Although most present equipment is far superior to what was available in 1950, and the limits of snowshoes on slopes have been expanded dramatically, there are still many possibilities for improvement. Some day someone is going to get it all together, and then our 1970s equipment will be comparable to the Spirit of St. Louis, hanging in the Smithsonian, as jet aircraft flit by overhead.

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