

LOSING OUR COOL: THE FUTURE OF SNOWSPORTS IN A WARMER WORLD

Introduction

Nancy Greene is one of Canada's most celebrated alpine skiers and a pioneer for women's elite sports around the world. The winner of gold and bronze medals at the 1968 Winter Olympic Games in Grenoble and overall World Cup titles in 1967 and 1968, Greene was named Canada's Female Athlete of the Century in 1999. Nancy Greene has been a household name in Canada for a generation of skiers. Greene's legacy lives on in Canada's current generation of Winter Olympians who came up the ranks of ski racing through the Nancy Greene Ski League. Since its beginning in 1967, the program has introduced thousands of children to alpine skiing and ski racing. Many of Canada's National Team athletes are a product of the League, including some of Canada's most accomplished racers. Ashleigh McIvor is one racer who attributes her success to the Nancy Greene Ski League and Nancy Greene herself.

"I grew up in Whistler and as a 10-year-old who just wanted to take chances and go fast, the Nancy Greene Ski League provided the opportunity for me to do just that. Nancy was the inspiration for all us young girls." - Ashleigh McIvor

Growing up in Whistler, McIvor began ski racing at age 10. Under the tutelage of Greene and her husband Al Raine, McIvor spent her summers training gates on the Horstman Glacier in Whistler and winters racing around Canada. For generations of racers like McIvor, Horstman Glacier was an essential summer training ground for a long winter season of racing on snow. McIvor's career led her to the top of the sport of ski cross, as both a World Champion in 2009 and Olympic gold medalist at the 2010 Olympic Winter Games in Vancouver.

The 2010 Olympic Winter Games made history in many ski events. Events that nearly did not happen because of a notable climate record: Vancouver was the warmest Winter Olympics on record since they began in 1924, hitting 100-year temperature highs around 12.5°C in mid-winter. The Olympic Organizing Committee had to improvise, building the ski cross course with straw and wood, and bringing in snow from nearby mountains by truck and helicopter. The events took place, barely. But Vancouver was not the last winter event to be affected by a warming climate.

The 2014 Olympic Winter Games in Sochi broke Vancouver's record as the warmest city ever to host the Games. It was serious. Athletes pulled out of training runs due to fear of injury on the sparsely-covered slopes. There was no hiding it from the media, who published headlines like "Weather Conditions Cause Problems with Crashes" and "Course is Dangerous as Snow Melts." In Sochi, the world saw the effects of a warming climate on prominent display and skiers saw the risk it poses for the future or the sport. Again, this being the Olympics, radical measures were taken and the events took place. But not all ski events would be so lucky. In fact, the 2022 Beijing Winter Games are predicted to rely entirely on artificial snow production.

“The weather and the snow conditions for the Olympics in 2010 was quite an eye opener. There was so little snow they had to build our jumps out of wood and hay. They were literally bringing snow in by helicopter just to get the hills covered up. It felt like April in mid-February.” – McIvor

With the average daytime temperature of Olympic host locations steadily increasing from 0.4°C at the Games held in the 1920–1950s to 7.8°C at the Games held in the early twenty-first century, many voiced concern for the future of the Winter Olympics and snow sports in an era of accelerating climate change. How is our changing climate affecting Canadian skiing and what will the next generation of skiers face in an era of future climate change?

A comparison of the climate conditions Olympic legends like Heggtveit and Greene, current champions like McIvor and Serwa, and the next generation train and compete under, reveals how the sport we cherish is changing and why we, as an outdoor community, must act to ensure Canada and the world achieve a rapid transition to a low carbon economy. Current and future Canadian winter athletes face the reality of skiing in the era of a rapidly changing climate.

Nancy Greene’s Legacy

Throughout her career, Nancy Greene witnessed a huge shift in ski racing. In 1946, three-year-old Nancy and her family moved to Rossland, British Columbia from Ottawa, Ontario. As the first place in Canada to hold a ski competition (1897), and an average winter temperature of - 5.5°C, Rossland was the perfect place for a young skier to grow up. During her teenage years Greene competed in the Canadian Junior Championships, wearing leather lace boots and wood skis competing on natural ungroomed courses. Through the early 1960s, as Nancy’s career began to take her all over North America, Europe and South America, technology was rapidly transforming skiing. Snow grooming began, equipment shifted to plastic buckle boots and fiberglass skis, and snowmaking machines, first developed in 1952, were slowly adopted across ski areas to increase their resilience to adverse weather and climate variability. Still, Greene made her Winter Olympic Games debut in Squaw Valley USA in 1960, competed in Innsbruck, Austria, and finally won Gold and Silver medals in the 1968 Grenoble, France, games all on natural snow.

After an incredible 1968 season, Greene retired from professional ski racing at the age of 24. Her dominant World Cup and Olympic performances led to Greene being named Canadian Athlete of the Year in 1967 and 1968 and inspired hundreds of children to follow in her footsteps and start ski racing, she was asked to serve on Prime Minister Pierre Trudeau’s Task Force on Sport and assist the Canadian Ski Team with fundraising and promotion.

Greene understood that youth participation was key to growing the Canadian ski legacy. But she also saw the difficulty young children face getting into ski racing. So in 1968 Greene started a nationwide grassroots ski program, The Nancy Greene Ski League, focused on fun and participation. The first generation of Nancy Greene Ski League youth to move successfully through the program include 1992 Olympic Downhill gold medal winner Kerrin Lee-Gartner and the Crazy Canucks.

As side cut skis, grooming techniques and snowmaking evolved, these early Nancy Greeners drove the revolution towards modern ski racing. Canadian Olympic Gold Medalists and Nancy Greene Ski League

alumni Ashleigh McIvor, Marielle Thompson and Kelsey Serwa followed. They also navigated a shift from traditional alpine events to racing head-to-head in the exciting new sport of ski cross. Current and future Canadian winter athletes are facing a revolution of a different kind: skiing in the era of a rapidly changing climate.

Generation Now

Racing and training conditions today are a far cry from the natural snow Nancy Greene won gold and silver and the World Cup Overall title on, 50 years ago. It wasn't until the 1980 Lake Placid Winter Olympic Games that snowmaking was introduced to ensure snowsport events could run uninterrupted, despite the worst snow drought in the Eastern US since 1887. Since then, snowmaking has grown to be a mandatory component of Olympic Winter Games and World Cup events to provide adequate snow coverage and quality as temperatures increase globally. Now, as a result of climate change, it would be difficult to imagine a successful Olympic Winter Games or World Cup event without artificial snowmaking, but there are already limits to what strategies will continue to work in an increasingly warmer world.

The average February daytime temperature across historic Olympic Winter Games locations have increased significantly from 0.48°C in 1920-1950 to 7.88°C at the recent Vancouver and Sochi Games. On Vancouver's Cypress Mountain, where Ashleigh won her gold medal in 2010, temperatures were too warm even for snowmaking machines. Ashleigh remembers the conditions clearly. "The weather and the snow conditions for the Olympics in 2010 was quite an eye opener. There was so little snow they had to build our jumps out of wood and hay. They were literally bringing snow in by helicopter just to get the hills covered up. It felt like April in mid-February."

Moguls, half-pipe and other freestyle ski and snowboard events faced similar conditions on Cypress while alpine skiing events in Whistler were postponed and rescheduled as rain, snow and fog mixed to create difficult if not dangerous conditions. Four years later, Sochi broke Vancouver's record as the warmest city ever to host the Olympic Winter Games, facing similar climate concerns as athletes pulled out of training runs due to fear of injury. Media headlines from Sochi stated "Weather Conditions Cause Problems with Crashes", "Course is Dangerous as Snow Melts." Conditions deteriorated rapidly. The 2022 Beijing winter games are predicted to rely entirely on artificial snow production.

Other international competitions, including World Cup, FIS, and X-Games events, are also at risk. Warm temperatures, low-snow, rain and extreme weather result in cancelled training runs, delayed start times, shorter courses or poor conditions and create potentially unsafe or unfair competitions. Coinciding with the warmest years globally, events at Squaw Valley, USA, Beaver Creek, USA, Lake Louise, Canada, and Levi, Finland, were forced to cancel or postpone in recent years. Classic ski events like the Kitzbuhel Hahnenkamm downhill in Austria have required helicopters to import snow from other valleys at high costs to avoid cancellation.

Beyond winter seasons, Canada is also losing summer training venues to climate change. Farnham Glacier used to be a key summer training site for Canada's Olympic athletes, but in 2011 WinSport announced it would cease operations due to frequently poor snow conditions. Similarly, Whistler Blackcomb's Horstman Glacier, a summer training arena where Nancy Greene coached a young

Ashleigh Mclvor, has been receding at a rate of half a million cubic meters each year. “Today’s receded Blackcomb Glacier is a stark contrast to the massive snowfield I remember skiing on throughout summer training as a kid. The T-bar doesn’t even work anymore” said a concerned Ashleigh. This year the iconic Horstman T-Bar was removed due to glacier melt. In 2017 after 28 years, Camp of Champions, a training camp for youth freestyle skiers and snowboarders closed because as founder Ken Achenbach says “simply put, it’s the effects of global warming.”

The loss of home ski venues, both winter and summer, has detrimental impacts on the future of Canada’s winter sports, pushing athletes to miss out on training and competing or spend time and money to travel further abroad to find snow. But skiing abroad is not guaranteed either. Glaciers like Saas Fee and Zermatt, in Europe, continue to retreat rapidly, leaving less space for on-snow summer training. Facilities on glaciers at Molltal and Tignes had to close training due to safety concerns as crevasses and water gutters opened up, while Stubai glacier in Austria has safety concerns related to a number of buildings sitting on melting permafrost. Åre in Sweden, Stelvio in Italy, and the Mt Hood snowfield in the US have all had to cancel summer training as a result of low snow, early snowmelt, and unseasonably warm temperatures in recent summers. Warming temperatures are affecting summer ski areas around the world.

The Next Generation

If high emissions continue, the Nancy Greene Ski Leaguers of today and tomorrow can expect much shorter seasons and more variable weather and snow conditions than Nancy Greene herself experienced, based on a study from the University of Waterloo. The average winter temperature in Nancy’s home resorts of Sun Peaks and RED Mountain have already increased by 1.3-1.4°C since her training days in the 1960s. With an expected increase of 5.3-5.4°C by the 2080s, average winter temperatures will be above freezing. Even with massive advancement and investment in snowmaking, local Rossland ski area Sun Peaks is projected to lose 12% of their current season by the 2050s and nearly a quarter of their season by the 2080s if the world continues to emit carbon at a high intensity.

For Ashleigh Mclvor in Whistler Blackcomb BC, her son Oakes can expect to see season lengths decrease by 9% over his lifetime into the late 21st century. Over the same timeframe, in Quebec, Olympian, World Champion and POW Canada member Erik Guay’s home mountain of Tremblant will lose between 13-20% of its current ski season and require 402% increase in snowmaking to continue to operate. Ontario ski racers following in the footsteps of Crazy Canuck Steve Podborski or current National Team and POW Canada member Erin Meilzynski can expect the ski areas they grew up on to disappear because of average seasons less than 20 days, even with 733% increase in snowmaking. Even Canada’s own Olympic and World Cup venues in Calgary and Lake Louise will see season lengths reduced by 28% and 16% respectively. The great white north is losing its snow.

Looking forward, a study of the ability of past Winter Olympics locations to host future games under projected climate change reached an alarming conclusion. The model, which requires operational snow depth minimums of 30 cm, with the probability of a minimum temperature of $\leq 0^{\circ}\text{C}$ to account for snow and ice surfaces refreezing overnight to provide fair and safe conditions for competitions, projects that none of the Olympic locations Nancy Greene and Ashleigh Mclvor competed at (Squaw Valley USA, Innsbruck, Austria, Grenoble, France, and Vancouver, Canada) will remain climatically suitable by 2050 if we continue emitting carbon at high levels.

Even if the Paris Climate Agreement Commitments are achieved, only 13 of 21 past hosts remain climate reliable for the Winter Olympics in the 2050s, and only 10 if we continue on our current emissions path. Paralympic Winter Games happening later in winter at the same destinations will be even less reliable. The locations that will remain climate reliable under high emission scenarios in the late twenty-first century include: North America – Calgary, Canada, and Salt Lake City, USA; Europe – St. Moritz, Switzerland, Cortina d’Ampezzo, Italy and Albertville, France; and Asia – Sapporo, Japan, PyeongChang, South Korea, and Beijing, China.

As climate change shortens season lengths, shrinks glaciers, reduces training venues, and impacts competitions across Canada and the world, there are increasing barriers to entry for youth participation. Loss of ski areas, shortened seasons and variable conditions due to climate change push young skiers to reduce their time participating, travel further distances to viable winter sport venues or substitute skiing with other sports. In particular, winter sports are most likely to lose female athletes, lower socio-economic groups and urban dwellers from climate impacts.

Some of the smaller ski areas across Canada are the most vulnerable to climate change without the financial ability to adapt or invest in the major snowmaking increases needed. Small grassroots ski areas like Mission Ridge Winter Park in Saskatchewan, where Olympic Gold Medalist and POW Canada member Mark McMorris started snowboarding, are important for developing participation, skills and interest of young athletes. With climate induced variable conditions, a few poor seasons in a row, such as the 4-year drought in California, can lead kids and teenagers to pursue other sports and activities and be less likely to ski later in life.

Home races like the Vancouver Olympics and Lake Louise Downhill are important cultural events where young athletes are exposed to international stars and high-level competition, build fan engagement and cultural ties to winter sports. Loss of these events has and will continue to result in undetermined setbacks to Canada’s winter sport culture and participation as well as loss of economic opportunities for across Canadian mountain regions.

Our Legacy

Meeting Paris Climate Agreement targets is key to protecting the winter sport legacies of Nancy Greene and every Canadian athlete who discovered the sport through organized programs like hers. The outlook for skiing in high and low emission scenarios are drastically different. It can be the difference between a 7 and 73-day season in places like Ontario. At low emissions, ski areas in Quebec would have to double their snowmaking budgets, at high emissions those budgets would need to quadruple.

In order to protect winter sports, organizations within the industry need to take action, to reduce their own considerable, negative effects on the climate. The Olympic Winter Games, X Games and other mega sporting events are massive generators of emissions through travel, infrastructure and waste. FIS, the international federation for nordic, alpine, and freestyle ski and snowboarding, remains notably absent from the climate conversation. In February 2019, FIS president Gian Franco Kasper apologized after referring to “so-called climate change”, suggesting that recently cold weather in parts of Europe disproved climate change and preferring to locate competitions in countries with dictatorships over democratic countries with strict environmental regulations. Clearly, we have work to do as an industry.

The UN Sports for Climate Action Framework aims to mobilize the global sports community to combat climate change and reduce greenhouse gas emissions. Athletes like Ashleigh McIvor act as a unifying force to drive climate awareness and inspire action among global citizens, they're making progress. The International Olympic Committee, X-Games, and International Climbing and Mountaineering Federation have committed to taking action on climate change. The IOC is championing carbon-neutral sporting events including the 2010 Vancouver Olympic Winter Games and the 2017 FIS women's World Cup in Squaw Valley. The events showcased new sustainable technologies that contribute to low carbon economy (e.g. public transit development and green buildings). The Winter X Games made comprehensive environmental stewardship a key component of all events and even had the head of the US Environmental Protection Agency in attendance.

Many individual winter sport athletes, coaches, sporting equipment brands, event sponsors and NGOs are outspoken on the current and future implications of climate on winter sports and the need for large-scale political climate action. A range of athlete-based organizations like Sport4Climate, Beyond Boarders, Athletes for Action and Protect Our Winters have over 200,000 active members across 16 countries. They emphasize the power of sports to unite, educate, encourage and engage climate awareness and action on a global scale.

Looking ahead just as Nancy Greene developed her ski league to help the next generation shape Canada's ski legacy, there is an important opportunity for the current generation to shape the future of skiing, in Canada and abroad, by the way we choose to address climate change. As Ashleigh says,

"We need to think big-picture here, and take it upon ourselves to make changes now for the long run. I want my son Oakes to be able to ski on snow throughout his entire lifetime. That would be really great. And even more importantly, I want this beautiful planet to stay healthy. That is the real goal here - to fight climate change and save our planet. Skiing is just the icing on the cake."

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