



The Snow Machines

Machine made snow has grown in Tahoe, but who does it help mo

two-part series, Moonshine looks at how snow machines are inserting their influence in the weather. In this part, we look at the practice of snowmaking at ski resorts, and next month, we'll look at how cloud seeding can influence precipitation.

BY DAVE ZOOK
Moonshine Ink

man who knows exactly what he's doing and loves to do it. He goes on to compare snowmaking to a soda production plant, or a sprinkler system, although the latter means something has gone terribly wrong and the guns are spraying water.

Pick your analogy, but it's a combination of art, science, labor, and technology, all wrapped up in the goal of putting white stuff on the ground when Mother Nature doesn't. Going into the winter of 2015/16, snowmaking may be playing a more pivotal role than ever for the state's ski industry. After four years of suffering with below average snowfall, Lake Tahoe

exemplifies the full spectrum of snowmaking efforts, from million dollar operations to nothing at all.

THE NEW POWDER STORM

I am told Northstar and Heavenly Mountain Resort, both owned by Vail Resorts, Inc., comprise the most sophisticated snowmaking operation in the Western U.S. At Northstar, up to 100 snow guns can run 24/7 when the weather is ripe, with the capacity to cover 75 percent of the mountain's trails with a calibrated mixture of air and water that join forces to make snow — all backed by a 12,000 horsepower energy system to get that air and water where it needs to be.

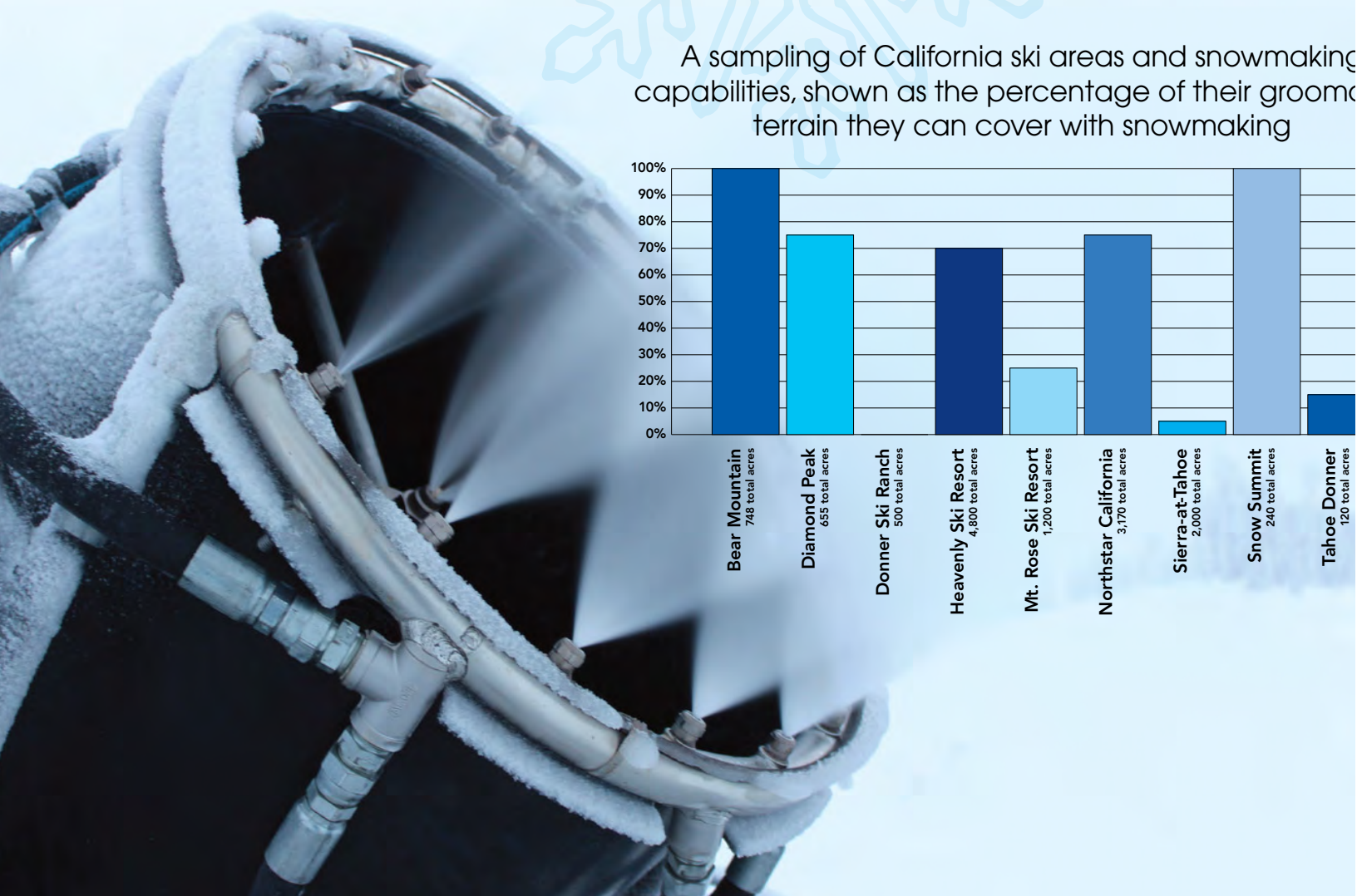
Automation is also the name of the modern snowmaking game. I watch "Hutch" work with four computer screens to monitor and fine tune compression levels, water temperatures, and much more. Larmore adds that he can do most of what Hutch does via smartphone when needed.

The day I visited, in early November, optimism was pulsing through the morning cold. The first storm of the winter came in as rain, which saturated the dirt before dropping temps froze it solid. Then 12 inches of natural snow fell over two days. To boot, cold air and low humidity — the recipe for high-output snowmaking — was forecast for the week.

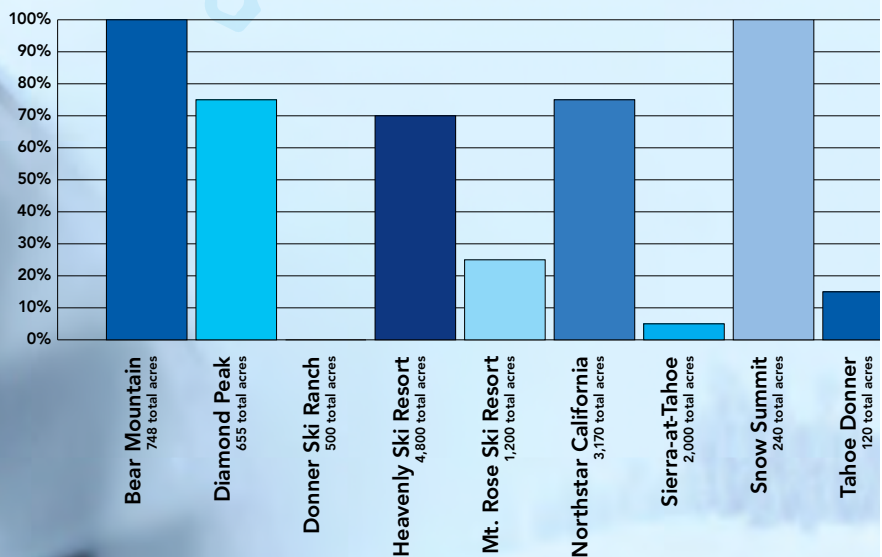
"This is looking like a very promising start," Larmore said.

Promising is a refreshing in the thirsty ski industry. In April, California Gov. Jerry Brown famously declared the Sierra snowpack to be 5 percent of the historical average, and the Central Sierra Snow Lab in Soda Springs recorded 130 inches of snow for the 2014/15 season, its all-time lowest recording since 1879, and many resorts in Tahoe received less than 200 inches.

Therefore, Northstar's investments make good business sense, and they mimic the trend around the country, where



A sampling of California ski areas and snowmaking capabilities, shown as the percentage of their groomed terrain they can cover with snowmaking



snowmaking is growing. A few resorts in California, such as Mountain and Snow Summit in Southern California, have almost fallen out of the equation, and made 100 percent snowmaking capabilities on their trails.

"In 2015, if you weren't making snow, you weren't a ski area," said Tim Porter, CEO of China Peak Mountain Resort in the central Sierra, and a former ski resort manager.

INTENTIOUS COMMODITY

Snowmaking lets resorts open earlier in the season, and keeps them alive during extended dry spells. But it pulls on large amounts of power, water, and is very expensive, making some people cautious to tout snowmaking as a solution to low snow.

"Snowmaking is a way to mitigate climate change in the short term, but is certainly not a long-term solution. It only does it use valuable water resources that are likely to get more scarce over coming years, but it is the most energy-intensive operation on the mountain by far," said Porter Fox, author of *Deep: The Story of Skiing and the Future of Snow*. "Not only are we using a lot of water that other resorts and communities might need, we are actually enlarging your carbon footprint by making snow. It seems counterintuitive for a ski resort these days."

Creating an area that is 200-by-200 feet — about two thirds of a football field — with six inches of snow requires 10,000 cubic feet, or 74,600 gallons of water, according to Snow Machines Inc., (SMI), the largest snowmaking equipment manufacturer in the U.S.-based. Resorts source water in different ways; some pull from public utility districts, while others have on-site wells or reservoirs.

However, snowmaking is considered a consumptive water use, as the majority of water is returned to the source when the snow melts. Snowmaking generally returns between 85 to 90 percent of the water to the watershed. The balance is lost to sublimation, evaporation, said Jeff Ewald, the general manager of SMI. Documents from the Truckee River Operating Agreement listed similar numbers, and noted that snowmaking is 16 percent cumulative.

Water use is difficult to breakdown specifically for snowmaking, and resorts are not keen to advertise exactly how much is spent on power

for snowmaking, though Larmore did comment that "the power company loves me."

However, there is no rallying cry to stop snowmaking. The benefits, the most obvious being more skier days on the mountain and more open terrain, are simply beneficial for a depressed industry. According to the National Ski Area Association, last winter's California ski visits were 4.1 million. This was down 8.8 percent from 2013/14, a year that was still more than a million skier visits under the long-term average. It's no shock then that industry representatives are not advocating that resorts shut down the guns.

"Mother Nature is unpredictable, but she is our biggest partner. She can give and she can take away," said Michael Reitzell, president of the California Ski Industry Association. "Knowing this, resorts have to think strategically and have a plan when she isn't as generous. Snowmaking allows resorts to run a seasonal business, offer the best experience they can for their guests, and operate with better certainty."

BIG GUNS GETTING BIGGER

In the 1930s, as the U.S ski industry was blooming, snowmaking meant transporting shaved ice, sometimes sourced from ice skating rinks, to the needed areas. Today, snowmaking happens through a calculated mix of air and water, and has grown tremendously. During the 2014 Winter Olympics in Sochi, for example, 400 snowmaking machines converted 230 million gallons of water to make enough snow to cover 500 football fields with two feet of snow.

There are several types of snow guns common to resorts, the most efficient being the fan gun, a cylindrical shaped apparatus. Fan guns release a combination of cooled water and pressurized air through nozzles on the inside of the cylinder that break up the water into tiny particles — this mixture acts as a seed for the water that is blasted from another set of nozzles on the perimeter of the fan. The result is still snow, just from a different mechanism and with a different crystal structure than the natural stuff.

The efficiency behind modern snowmaking has increased up to 40 percent over the last few decades, mainly due to the automation of modern systems, according to Nic

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...an, the West Coast sales rep
 MI. Snowmaking capabilities
 also increased during warmer
 temperatures. This is bluntly relevant
 Sierra Nevada resorts, where the
 average for 2014/15 was 32.1
 inches, the first time in 120 years of
 record keeping that the temperature
 stayed above water's freezing point,
 according to California Climate
 Center.

WHITE OR WRONG

...e resorts have been pumping out
 machine made snow for decades, with
 nearly every Tahoe resort currently
 making snow, but the practice varies
 tremendously between resorts. The
 profits hinge on the resort's clientele,
 location, type of mountain, and more.

...have seen more interest overall,
 especially recently, it's mostly from
 smaller resorts that are having
 a really hard time with the winters,"
 Hancher said.

...se study for snowmaking's success
 at Heavenly Mountain Resort, the
 1,000-acre resort perched on Donner
 Peak directly off Interstate 80.
 In 2007, the resort invested heavily
 in snowmaking, and that investment



HIGH-TECH SNOW: David "Hutch" Hutchison, who works in advanced snowmaking, and Jim Larmore, senior mountain operations director, monitor Northstar California Resort's snowmaking system through several software programs. Photo by Dave Zook/Moonshine Ink

...is credited to being in the very slim
 category of California resorts that
 didn't hurt deeply for visitation
 in 2014/15. Boreal is a perfect fit
 for snowmaking as the majority of
 guests are terrain park riders or
 beginner skiers and snowboarders,
 a demographic that doesn't place
 importance on natural snow,
 according to Cohee. The mountain
 is also small, making top-to-bottom
 coverage less resource-intensive, and
 attractions like Woodward Tahoe
 are non-snow dependent. "The last
 four years they came closer to their
 visitor expectations than anyone in
 California," Cohee said.

Kirkwood, known for advanced
 off-piste skiing, and 40 minutes
 from the city of South Lake Tahoe,
 is on the other end of the spectrum.
 On a low snow year, South Lake
 skiers are very unlikely to travel the
 extra distance to Kirkwood when
 Heavenly is located central to South
 Lake with a behemoth snowmaking
 operation. "Certain resorts will never
 be successful on manmade snow," said
 Cohee, who was Kirkwood's CEO for
 17 years.

Heavenly has a historic snowmaking
 story that has been featured in
The New York Times and *Bloomberg
 Businessweek*. With 68 fully-automated
 fan guns, 90 air/water snow guns,
 30,000 feet of pipes and hoses, and
 a staff of 39, their snowmaking can
 cover 70 percent of their 1,000 acres of
 trails. As a result, they haven't missed
 an opening day in over 10 years.

They also kick started the snowmaking
 movement in Tahoe in the late '70s,
 due to the vision of then-owner Bill

Killebrew. After some lousy winters
 that brought on debt, Killebrew
 pushed Heavenly back to profitability
 by the late '80s, due to their
 expanding snowmaking system. Many
 Tahoe resorts soon followed suit.
 Barrett Burghard, the senior manager
 for snow services at Heavenly, has
 seen the system grow over his 22 years
 at the resort, with a major jump in
 capital investments when Vail Resorts,
 Inc. purchased the mountain in 2002.
 "The automation and subsequent
 efficiency went way up. The system
 was pretty rudimentary before that,"
 Burghard said.

Most of the larger resorts around
 Tahoe have high snowmaking capacity.
 Squaw Valley/Alpine Meadows has
 invested \$8 million in its snowmaking
 operations over the last five years and
 bought 15 new high-efficiency HKD
 SV10 snowmaking guns for 2015/16.

Other resorts are bulking up or
 initiating their snowmaking, looking
 to insure their winters. Mt. Rose
 Ski Tahoe upped its snowmaking for
 2015/16 to cover about 25 percent of
 the mountain with around \$500,000
 of their \$1.2 million investment
 going to snowmaking infrastructure,
 according to Mike Pierce, head of
 marketing. Tahoe Donner Cross
 Country and Downhill will make
 snow for its first time this winter.
 They purchased seven Silent Polecats
 — low energy, low noise snow guns,
 for which Tahoe Donner will be the
 first to use in North America — for a
 total investment of \$1.1 million. The
 cost includes the seven Polecats, a
 pump station building, 12 hydrants
 and electrical pedestals, and a cooling
 tower.

A few resorts don't make any snow
 such as Donner Ski Ranch, the 500
 acre, family-owned ski area where
 an adult season pass goes for \$249. They
 had a small snowmaking operation
 prior to 2008, but after that year's
 water issues and equipment failure
 they ceased snowmaking operation.

THE OUTLIER

Despite the trend of growth in
 snowmaking, not everyone is saving
 their money for more snow guns.
 Sierra-at-Tahoe, located 12 miles
 west of South Lake Tahoe, is a local
 example of alternative solutions to
 snowmaking, where president John
 Rice says he "repurposes every fla

Sierra-at-Tahoe suffered its shortest
 season ever in 2014/15, closing
 on March 16, but Rice remains
 optimistic; armed with a litany of
 tactics and techniques to squeeze
 the most out of what nature provides
 at a lower cost than snowmaking.

"We are now in the snow farming
 business," Rice said, not sarcastic.
 When the parking lot accumulates
 enough snow, his team will "corn
 the snow into long lines using snow
 moving equipment. He then uses
 snow blowers to spray the snow into
 the beds of rented dump trucks that
 unload the piles around the mountain
 to then be pushed and smoothed
 by groomers on the driest areas.

The mountain also keeps its snow
 trails as free of debris like rocks and
 trees as possible, so it can open on
 very little. "The old owners used to
 say we could open on frost," Rice
 said. Summer crews will take months
 to the trails remove rocks and trim
 small trees. Employees even insti-
 tute a "bucket brigade," where they
 dig up snow from the shady north-fac-
 ing aspects and haul them to the trail
 using five gallon buckets.

But no matter how far resorts can
 go with finding creative solutions
 or stay open through multi-million
 dollar snowmaking investments, there
 is simply no replacement for the
 bountiful natural snow storms, still
 what every resort and skier hopes

"Every resort is looking at Dec. 2
 the day they need to be open. There
 is so much emphasis on the holiday
 season," Cohee said. "If it snows a lot in the
 early season, California will save
 hundreds of millions of dollars on
 snowmaking, plus a lot of skiers will
 be happy." (P)

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