



Snowmaking in Utah's Cottonwood Canyons is consumptive and not a good method of water storage: Consumptive Water Use (Evaporation and Sublimation)--Chemicals--Environmental Impacts (Reduced Instream flows, Frozen Fish, Turbidity, Greenhouse Gas Emissions)

- Consumptive Use (Evaporation and Sublimation):
How much water is consumed due to snowmaking (10% to 20%) depends on the machine, type of snow being manufactured, altitude, weather, etc.. Lots of water and less air produces heavy wet snow. Less water and lots of air produces light powdery snow which has a higher evaporative factor. Low humidity, high temperatures versus high humidity and low temperatures effect the consumption of water due to snowmaking. The number of days the snow is on the ground after being manufactured is a factor.

Water used in snowmaking is also consumed through sublimation where snow and ice turn directly into a vapor.

“Sublimation is the conversion between the solid and the gaseous phases of matter, with no intermediate liquid stage. For those of us interested in the water cycle, sublimation is most often used to describe the process of snow and ice changing into water vapor in the air without first melting into water. The opposite of sublimation is



“deposition”, where water vapor changes directly into ice—such as (sic) and frost.”¹

The consumptive use estimates for snowmaking vary with estimates between 10%² to 20% of the water being consumed by evaporation and sublimation. The actual figure varies according to location, machine, type of snow manufactured, etc..



- Chemicals:

1 “The Water Cycle: Sublimation” USGS The Water Cycle (Water Science for Schools) December 31, 2007

2 “Consumptive Water Use In Artificial Snowmaking Santa Fe Ski Area, New Mexico” New Mexico Engineer Office Technical Report #45 June 1985 by Alan W. Smart United States Forest Service and William M. Fleming New Mexico State Engineer Office

“For skiing, snowboarding and other winter sports, fake snow must look, feel and act like the real thing. Machine-made snow has been refined by the ski industry and depends more and more on chemicals and new materials to be as realistic as possible, says the magazine.

Most artificial snow made for skiing and snowboarding still relies on good old frozen water, but the trick is using seed materials. The seeds essentially serve as a nucleus around which water molecules can be formed into ice crystals.

As long as it's cold enough (15-20 degrees F) just about any impurity can serve as the seed. Calcium, magnesium ions, or impurities such as clay particles or organic matter all will work well. If it's not cold enough (23-30 degrees F), more complex seed materials must be added to the water in order to form the crystals. Silver iodide, soaps and detergents, and fungi or lichens are some of the materials that have been used.

The most popular seed additive, according to the magazine, is Snomax®, a freeze-dried protein powder that produces very realistic-looking snow.

A newcomer that is making a big impact in the artificial snow market is Drift, an additive that allows water to freeze more quickly and speeds the preparation of the slopes.

If all else fails, there are "dryslope" products — sort of like snow carpets — that can be rolled out and used in any temperature by skiers and snowboarders. One such dryslope product is Snowflex — a carpet-like mat with a slippery surface backed with a shock-absorbing pad that can be laid down to create an instant slope. Built-in water tubing keeps the surface of the mat wet and helps reduce friction.”³

“Snowmax, a freeze-dried protein powder sold by York Snow, Victor, N.Y. Snowmax is derived from *Pseudomonas syringae*, a common bacterium found on grasses, trees, and vegetables crops. In the 1970's, plant pathologists studying the frost sensitivity of corn plants at the University of Wisconsin, Madison, discovered that the bacteria were responsible for initializing ice crystallization [Nature, 262, 282 (1976)].

A newer seeding product taking the market by storm is called Drift, a liquid polyether-substitute trisiloxane produced by Aquatrols in Cherry Hill, N.J. Drift works as a surfactant to decrease the level of hydrogen bonding in water so the water can freeze more quickly, according to the company.”⁴

It is unclear if other anti-freeze like chemicals are required to keep the water from freezing in the hoses prior to being shot into the air.

- Environmental Impacts:

Naturally, snowmaking would increase turbidity by adding water to high spring run flows from the artificial augmentation of natural snowpak.

Some environmentalist believe removing water from any natural source is dangerous which



3 American Chemical Society. “Artificial Snow Creates Winter All Year Round.” (January 20, 2004) ScienceDaily.com/releases/2004/01/040120035003.htm

4 “What's that stuff?” Science & Technology Volume 82, Number 03, CENEAR 82 03 P.72 ISSN 0009-2347

makes no sense in western states like Nevada, Utah, Colorado, New Mexico, California, etc.. If water were not removed from creeks and rivers for irrigation, these states would not be the economic engines they are today.

Logically, if streams become too shallow, trout and other aquatic species may become trapped and freeze.

“The Environmental Protection Agency expressed concern over harmful runoff by ski resorts in a Federal Register Document published in July, 2000.

“EPA expressed environmental concerns regarding the lack of information to support expansion of the ski area; inadequate analysis and disclosure of indirect effects of induced development; and effects of additional snowmaking and increased wastewater pollutant loading to area ground water.” according to the EPA website.”⁵



- Greenhouse Gas Emissions:
Common sense indicates snowmaking requires a lot of energy. Diesel engines with high environmental impact may be required to run the high volume air compressors and enormous electric motors requiring massive amount of electricity are required to pump water into the compressed air stream. High velocity fans require motors which may be powered by gas or diesel discharging petro-fumes into the airshed and watershed.

While snowmaking has its positives and negatives, in the Cottonwood Canyons of Utah, snowmaking is not a good method for storing water and is a consumptive water use. Currently, a portion of the high spring run off bypasses the treatment plant and irrigation weirs and runs to waste. Snowmaking in Utah's Cottonwood Canyons would exacerbate unusable high spring flows, increase turbidity, increase the fish freeze potential, increase loading in the canyons, as well as consume in inordinate amount of energy to create an artificial condition.

In summary, snowmaking is a consumptive water use with environmental impacts which may exceed water use consumption and environmental impacts for domestic water use in Cottonwood canyon watershed areas.

Tens of thousand of skiers (resident and non-resident) flood the watershed as an acceptable and beneficial practice; however, canyon property owners are cut off from using Utah's water held by the Salt Lake City water monopoly which grants water contracts for snowmaking.

This presents a very odd dichotomy. Water is used in a “desireable” polluting fashion for leisure industries like skiing, boating, yet water is denied to “undesirable” less impacting property home occupancy right uses.

- Skiers are in. Canyon land owners are out.

⁵ “The Cold Hard Facts of Snowmaking: Ski resorts turn to snowmakers to extend warmer winters, sometimes with environmental consequences.” by Andrew Waite Daily Free Press Issue date 1/31/06 Section: Science



- Gas & oil powered boaters are in. Canyon land owners are out.
- Diesel powered canyon travel buses are in. Canyon land owners are out.
- Fishermen are in. Canyon land owners are out.
- Picnickers, hikers, and mountain bikers are in. Canyon land owners are out.
- Sewer effluent and Mine Tunnel water are in. Canyon land owners are out.

A balance needs to be struck between the environmental impacts of using water for snowmaking for economic benefit derived from a leisure industry and the rights of canyon property owners to live full or part season on their property.

Years ago environmentalists decried the oil pipe line in Alaska saying the caribou would be decimated. After the pipeline was built, the caribou population increased 10%. Seems the caribou increased mating around the warm pipeline. Is it possible that excluding canyon land owners from building part or full season cabins could improve the watershed?



The watershed protection mentality is that the private property owner is not to be trusted. Big brother knows best. Control of the watershed by the water department permits and watershed patrolmen is paramount. If, however, the public is not under the thumb of the water department, then the sky is falling. Lots of folks live around the Sundance Ski resort, in Midway, Heber, Wallsburg, etc. which is watershed for Salt Lake City. In fact, 11,489 new homes are proposed on SLC's drinking watershed and the discharge of sewer effluent into the Provo River⁶, yet the the sky is not falling there. Why does the sky only fall in the Salt Lake County Cottonwoods?



There is plenty of water for snowmaking, boating, picnickers, hikers, campers, houses, etc. Surely, there are a few pre-artificial snow flakes for canyon property owners to use to live on their land.



⁶ "Sewer plant may tinge Provo River's clean-cut image" Salt Lake Tribute July 1, 2008
www.sltrib.com/news/ci_9747857