



# Wastewater on the Peaks

## Big Cost for a Bad Idea

**Wastewater Bulletin**

**September 2006**

The City of Flagstaff’s decision to sell reclaimed wastewater to make snow at the Arizona Snowbowl is a misallocation of resources. The 180 million gallons of reclaimed water that could be sold each winter, is equivalent to six percent of Flagstaff’s annual water use. Voters have recently had to approve a \$15 million bond for the purchase of new water supplies, with a second \$15 million bond for the drilling and development of as many as six new water wells. Given the increasing demand for water and high cost of new projects, it is time for a full public discussion on the role of reclaimed water in Flagstaff’s long term water supply.

### “Experts say aquifers running dry”, Headline Arizona Daily Sun, August 13, 2006

According to a draft Bureau of Reclamation report, *North Central Arizona Water Supply Study: Report of Findings*, Flagstaff and its surrounding communities are at risk of using more ground water than they can sustainably pump by 2050. This report, to be released in September 2006, offers several regional solutions. The alternatives include a combination of projects, such as building pipelines from Lake Powell and drilling new wells in the Coconino Aquifer. Each alternative has a large price tag—\$441 million to \$550 million!

One of the alternatives in the draft report includes a project to drill wells in the Coconino Aquifer to provide Flagstaff with water. Construction costs for this project could be over a \$100 million, with annual operating costs of \$20 million. The estimated cost for water from this project is between six dollars, to a little over eight dollars, per thousand gallons of water. City residents currently pay \$2.83 per thousand gallons.

Conservation programs that include advanced treatment processes to clean reclaimed water for safe reuse and recharge could save taxpayers money by reducing the need for new water projects. For example, the City has offered to sell reclaimed water to the Arizona Snowbowl for as little as 80 cents per thousand gallons. Instead of allowing reclaimed water to be piped for 14.8 miles to the slopes of the San Francisco Peaks, the City should develop a plan to provide city residents with a safe, reliable and cost effective water supply.

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# Wastewater in the Natural Environment... a

## Plants and Pollution

In the arid Southwest, the health of human and ecological communities is connected by the common thread of water. Just as threats to human health exist from the consumption of reclaimed wastewater, artificial snowmaking has the potential to affect native vegetation, soils and wildlife. Like DDT, chemicals found in Flagstaff's reclaimed wastewater are substances that affect living organisms and accumulate in their tissue. This means that their biological effects can be greatly magnified when delivered to the San Francisco Peaks ecosystem.

The effects of snow made from reclaimed water are not likely to be confined to the boundaries of the Arizona Snowbowl. Pollutants, such as added nitrogen and dissolved salts, can be carried downstream, potentially impacting riparian habitat and springs that serve as domestic drinking water sources.

Most mountain ecosystems in the West have evolved under nutrient-limited conditions. Application of treated effluent to the proposed 203 acres of ski runs will increase nutrient loading to these areas. Nutrient concentrations in treated effluent are typically higher than those observed in natural precipitation. The November 2002 report, *Hydrologic Considerations Associated With Proposed Snowmaking at Arizona Snowbowl*, by Dr. Abe Springer and consulting hydrologist Peter Schwartzman, states that atmospheric rates of nitrogen deposition in the Flagstaff


area have increased by almost 70 percent over the last 20 years. The use of artificial snow would shift this increase to about 160 percent over the historic background on affected slopes. This increase is the result of high levels of nitrate in reclaimed water, which are further concentrated by evaporation and sublimation.

The addition of nitrogen to the natural system can create conditions that allow for rapid growth, giving competitive advantage to **exotic and invasive species**. The Forest Service environmental analysis focuses on impacts to disturbed areas within the ski area. Little attention was given to adjacent habitats dominated by native plant species. The Forest Service notes that overall plant diversity might be reduced in some areas, but that this impact would be restricted to developed ski trails. There is no explanation as to why these effects are not expected to happen outside of the ski area boundaries.

The added nitrogen from man-made snow could jeopardize a globally rare Bebb willow wet meadow community by altering the composition of plants in the understory. Located in the Hart Prairie and Fern Mountain areas, it is the largest of only 20 communities existing in the world.

The relatively pristine nature of a remote alpine ecosystem is one of the least desirable places to experiment with the dispersal of effluent.





# A Dangerous Experiment?

## Contaminating Wildlife

City of Flagstaff treated wastewater is tested for a variety of contaminants. Many chemicals in our water, however, cannot be removed by current reclamation technologies. Along with the potential to impact human health, these chemical agents produce biological effects that may impact the viability of wildlife populations and alter ecosystem functions.

In December 1999, two scientists, Daughton and Ternes, writing in *Environmental Health Perspectives*, a peer-reviewed journal, noted that the quantity of pharmaceuticals and personal care products entering the environment each year is roughly comparable to the amount of pesticides used each year. "Unlike many pesticides, most drugs and personal care products have not been examined for adverse environmental effects."

According to Paul F. Torrence, Ph.D., Professor of Chemistry and Biochemistry at Northern Arizona University, the work of Daughton and Ternes points out that these chemicals have several worrisome characteristics.

- Many of these chemicals are designed to have profound physiological effects.
- Nothing is known about how the chemicals in reclaimed water may accumulate in the soils of the San Francisco Peaks, eventually magnifying their available concentrations and resultant biological effects.
- Some chemicals are long-lived and break down into other long-lived compounds with their own peculiar chemical characteristics.
- Some of the reclaimed water chemicals can be transformed in the unique environment of high altitude mountains to even more toxic agents.

## Flagstaff "Studies" the Issue

The City of Flagstaff is increasing the use of reclaimed wastewater without all the facts. There is increasing evidence of pharmaceutical, industrial and household waste compounds in local watersheds. The City has funded a study by the United States Geological Survey (Water Resources Division) and Dr. Catherine Propper (Department of Biological Sciences at Northern Arizona University). This study, *Determining the Occurrence and Endocrine Disrupting Capacity of Pharmaceutical, Industrial, and Household Wastewater Compounds, Nutrients, and Selected Trace Elements in the Vicinity of Flagstaff, Arizona*, will be completed in 2008.

Preliminary results of this study indicate that "reclaimed treated effluent from the storage tank at Buffalo Park could affect the feeding behavior and development of frogs." The study shows that compounds in the wastewater act like a thyroid hormone, or stimulate the release of a natural thyroid hormone. This may influence embryo development, neurological function, and other important developmental processes. This preliminary study raises concerns about potential impacts to amphibian species such as the Western striped chorus frog and the tiger salamander, found directly downstream from the Snowbowl in the Fern Mountain Botanical Area and Hart Prairie Preserve.

Despite the fact that the City of Flagstaff is only two years into the four-year study (USGS and Dr. Propper), the City is proceeding with plans to partially fill the Frances Short Pond, at Flagstaff Middle School, with reclaimed water. According to an August 5, 2006, *Arizona Daily Sun* article, the Arizona Game and Fish Department will continue to stock the pond with fish, and claim that eating fish raised in this water is not an issue of concern.

## A Threat to Culture

The use of reclaimed water on the San Francisco Peaks poses a direct threat to the cultural beliefs and traditions of thirteen Native American Tribes in the Southwest.

A variety of plants that grow on the Peaks are used for healing or ceremonial purposes. The Forest Service environmental analysis states that the residue of unregulated compounds, such as pharmaceuticals, hormones and pathogens, could negatively affect the spiritual and medicinal purity of plants on the Peaks.

Hualapai healing ceremonies performed on the reservation receive their power from prayer feathers placed on the Peaks and from medicinal plants gathered there. The exposure of these prayer feathers and plants to reclaimed water will contaminate the feathers and plants rendering them ineffectual for healing ceremonies and any other religious purpose.

For the Navajo, the Peaks are the sacred mountain of the West, a key boundary marker and a place where medicine men collect herbs and plants for healing ceremonies. These ceremonies are a vital part of Navajo life. The Enemy Way ceremony has proven effective in healing the psychological illnesses of Navajo soldiers returning from war. The mountain soil bundle is prepared on the Peaks for the Blessingway ceremony, the foundation of the Navajo way of life. If the Sacred Mountain is desecrated by reclaimed water, the healing powers of the soil, herbs, water and sacred objects from the mountain will be diminished or destroyed.

The Peaks are an essential element of Hopi Culture, religion and survival. The Hopi call the San Francisco Peaks, Nuvatukyaovi, meaning "Place of Snow on the Peaks." As the spiritual home to the Katsina, these mountains are the focus of Hopi prayers for rain and snow. Man-made snow will interfere with the natural process of precipitation. The use of reclaimed water is viewed as unsanitary, with the potential to negatively impact medicinal herbs and shrines around and within the Peaks.

## Flagstaff's Economy

The cultural traditions and religious beliefs of Native American Tribes are important to Flagstaff's community identity and economy. Native American cultural events, craft festivals and shows bring tourists from around the world to our region. The Museum of Northern Arizona hosted 8,700 visitors for the 2006 Hopi and Navajo shows.

The City of Flagstaff's decision to sell reclaimed wastewater for use on the San Francisco Peaks has the potential to alienate a large number of people who currently live or shop in Flagstaff. The U.S. Bureau of Census data for the year 2000 shows that 33,161 people of Native American descent live in Coconino County. Eight and a half percent of Flagstaff's population is Native American.

Tourism is the primary industry in the Flagstaff area. The Grand Canyon attracts between four and five million visitors each year. While people are attracted to skiing in Flagstaff, the Final Environmental Impact Statement notes that, "In contrast with a number of other ski resorts in the Rocky Mountain region, the Arizona Snowbowl is not a dominant driver of growth and the economy in its host community." A comparison of BBB tax revenues in recent "good" and "bad" ski seasons illustrates this point. The Snowbowl was open for 138 days during the 2000-2001 season and only four days in a 2001-2002 season and yet the 2001-2002 (bad) season returned slightly higher BBB tax revenues!



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