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DON'T EAT THE BROWN SNOW! UTILIZING WASTEWATER FOR ARTIFICIAL SNOW: A SLIPPERY SLOPE BETWEEN PROTECTING SKIERS AND ENCOURAGING WATER REUSE

> "With climate change threatening to diminish water supplies . . . more cities are considering the potential of reclaimed water. . . . The bigger hurdle to public acceptance may be psychological."[1]

I. Introduction

Changing climate conditions are causing many problems for an important and entertaining industry: the ski industry.[2] Decreases in snowfall have forced ski areas to increase their production of man-made snow; they are restricted in their ability to do so, however, because of diminishing water supplies.[3] For example, in the 2008 ski season, Arizona Snowbowl (Snowbowl), a ski resort in Arizona, had thirty-two days of snowfall, amounting to 236 inches of snow.[4] In 2014, however, Snowbowl only had eleven days of snowfall, amounting to sixty inches of snow.[5] Various ski resorts—from Arizona, to Pennsylvania, to Australia—are beginning to cope with the environmental pressures of conserving water and depleting snowfall by utilizing treated wastewater to help produce snow.[6]

More recently, California is learning to survive under drought conditions; one of the state's anticipated methods is utilizing

1. Felicity Barringer, *As 'Yuck Factor' Subsides, Treated Wastewater Flows from Taps*, N.Y. Times (Feb. 9, 2012), http://www.nytimes.com/2012/02/10/science/earth/despite-yuck-factor-treated-wastewater-used-for-drinking.html?pagewanted=all&_r=0 (determining "yuck factor" as primary reason for slow adoption of utilizing wastewater for snowmaking).

2. *See id.* (discussing progress and obstacles of ski resorts using treated wastewater for snowmaking).

3. *See id.* (highlighting motivations ski resorts have for finding alternatives to natural snow).

4. *Arizona Snowbowl Historical Snowfall*, On The Snow, http://www.onthesnow.com/arizona/arizona-snowbowl/historical-snowfall.html?&y=2008&q=snow&v=list (last visited May 31, 2015) (displaying days of snowfall in 2008).

5. *Arizona Snowbowl Historical Snowfall*, On The Snow, http://www.onthesnow.com/arizona/arizona-snowbowl/historical-snowfall.html?&y=2014&q=snow&v=list (last visited Oct. 9, 2015) (displaying days of snowfall in 2014).

6. For a discussion of ski areas using treated wastewater for snowmaking, see *infra* notes 51-74 and accompanying text.

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treated wastewater as potable drinking water.[7] California measured its statewide snowpack level in April 2015, the month that historically has the peak snowpack level; the snowpack amounted to only 1.4 inches thick, whereas the historic average is twenty-eight inches.[8] Due to the drought conditions, many proponents are advocating that wastewater be purified into potable drinking water and to be used in many other ways.[9] The controversial "yuck factor," however, inhibits this movement and is discussed in the *Potential Risks and Benefits* section of this Comment.[10]

Opponents contend the use of wastewater for recreational activities, such as skiing, could contain many contaminants originating from runoff and sewage if the water is not treated properly.[11] Opponents also intensely debate this subject because a nominal amount of research has been completed analyzing the harmful effects that the use of treated wastewater has on both surrounding ecosystems and people who come in contact with the substance.[12] Applying treated wastewater in snowmaking creates a new quasi-consumable category for determining water quality standards.[13] While treatment standards currently exist for both irrigation purposes, which is based on the minimal likelihood of human contact,

7. *See generally California Drought*, CA.GOV, ca.gov/drought (last visited May 31, 2015). As of May 2015, California is experiencing the most extreme drought on record. *See id.* Methods to combat the drought include funding schools that promote stormwater capture and hosting irrigation workshops. *See id.* The two major reservoirs for California are at 73% and 67% of their historic averages, leaving almost 47% of California's population in the most extreme categorized drought conditions. *See How Low Can Snow Go?*, CA.GOV (April 1, 2015), http://www.water.ca.gov/waterconditions/news-archive.cfm (discussing statistics demonstrating extremeness of drought conditions); *see also U.S Drought Portal*, NIDIS, https://www.drought.gov/drought/area/ca (last visited May 31, 2015) (displaying drought conditions geographically in California).

8. *See U.S Drought Portal*, *supra* note 7 (identifying severe difference in amount of snowfall throughout state of California). "Snowpack" refers "to the total amount of snow and ice on the ground." *The Signs of Climate Change*, EPA, http://www3.epa.gov/climatechange/kids/impacts/signs/snowpack.html (last updated Aug. 20, 2015) (defining snowpack as measure to determine climate change impact).

9. *See* Monte Morin, *Turning Sewage into Drinking Water Gains Appeal as Drought Lingers*, L.A. TIMES (May 24, 2015, 8:50 PM), http://www.latimes.com/local/california/la-me-toilet-to-tap-20150525-story.html (identifying reuse of wastewater as method to cope with drought in California).

10. For a discussion of the "yuck factor," see *infra* note 75-79 and accompanying text.

11. For a discussion on the dangers of utilizing wastewater improperly, see *infra* notes 80-107 and accompanying text.

12. For a discussion of current research on wastewater utilized as snow, see *infra* notes 93-107.

13. For a discussion on characteristics of quasi-consumable activities, see *infra* notes 14-16, 121-125, and accompanying text.

and for potable drinking water, which is based on direct consumption, using treated wastewater to create snow is a middle ground between these two categories.[14] While consuming snow during skiing is a foreseeable and probable consequence, this middle zone would not be based solely on the direct consumption of snow, and thus it creates a quasi-consumable category for treatment purposes.[15] This use of treated wastewater is relatively new and innovative; while it nurtures the ski industry's development, little research unfortunately exists and consequently, governments have had little progress in ensuring adequate water quality in ski areas.[16]

This Comment analyzes the progress that United States courts and global regulatory organizations have made in ensuring water treatment quality and safety based on the potential harms and benefits of using treated wastewater for snowmaking.[17] First, this Comment explains what wastewater is and the traditional uses of treated wastewater.[18] Second, this Comment analyzes how reusing wastewater for artificial snow differs from the traditional uses of wastewater.[19] Third, this Comment explains potential impacts of using wastewater to create snow and how the courts address using wastewater for artificial snow.[20] Fourth, this Comment analyzes how government organizations are reacting to this new technique of conserving water and creating snow.[21] Finally, this Comment discusses what actions are necessary to further develop the law in this area and how ski resorts will likely respond in the future.[22]

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14. For a discussion on the standards for irrigation and potable water, see *infra* notes 164-206 and accompanying text.

15. For a discussion on the standards required for various activities, see *infra* notes 164-206 and accompanying text.

16. For a discussion on regulations and the progress of government-controlled directives regarding water reuse quality for snowmaking, see *infra* notes 164-206 and accompanying text.

17. For a discussion of progress that United States courts and global regulatory organizations have made in ensuring water treatment quality and safety based on the potential harms and benefits of using treated wastewater for snowmaking, see *infra* notes 18-221.

18. For a discussion on wastewater, see *infra* notes 23-46 and accompanying text.

19. For a discussion on wastewater used for snow, see *infra* notes 47-74 and accompanying text.

20. For a discussion on the benefits and drawbacks of using wastewater, see *infra* notes 75-125 and accompanying text. For a discussion of a court's analysis of how to address using treated wastewater for snowmaking, see *infra* notes 126-163 and accompanying text.

21. For a discussion of standards implemented or suggested by governmental organizations, see *infra* notes 164-206 and accompanying text.

22. For a discussion of what to expect in this area of law and in the ski industry, see *infra* notes 207-221 and accompanying text.

II. WHAT IS WASTEWATER AND HOW IS IT USED?

Before understanding the impact wastewater has on the environment, one must understand what wastewater is.[23] This section explains wastewater, describes the treatment process, discusses how wastewater can be used after it is treated, and, finally, analyzes which factors are critical in determining if the wastewater is purified to a proper level.[24]

"Wastewater is used water"; this type of water encompasses human waste in homes and businesses, ranging from food scraps, to bathtubs and toilets, to soaps and chemicals.[25] Wastewater is not limited to human waste; it also includes storm run-off, material on house rooftops, and salt on roads.[26] Hydraulic fracturing, commonly known as fracking, also contributes to the waste found in wastewater; without treatment, wastewater can include "heavy metals, volatile organic compounds, salty brine and radioactive materials" that are released during the fracking processes.[27] Untreated wastewater can contain many disease-causing bacteria and pollutants that disrupt ecosystems.[28] Any solid material left over in the water decays while in the water; the process of decaying requires oxygen, which other plants and animals living in the water need to survive, but will be deprived of due to the decaying process.[29]

Due to the hazards associated with permitting the solid material to remain in the water, we treat the wastewater to remove these

23. For a discussion of the potential impacts wastewater has on the environment, see *infra* notes 75-125.

24. For a discussion of what wastewater is and the treatment process for converting wastewater into recycled water, see *infra* notes 25-46 and accompanying text. For a discussion of how wastewater is used once treated and some factors that determine the requirements for different uses, see *infra* notes 47-71 and accompanying text.

25. *Wastewater Treatment, Water Use*, USGS, http://water.usgs.gov/edu/wuww.html (last updated July 30, 2015, 2:17 PM) (identifying typical substances found in wastewater resulting from human waste and explaining necessity to treat wastewater to protect environment and human health).

26. *See id.* (discussing other sources of material found in wastewater).

27. *Wastewater*, CATSKILL MOUNTAINKEEPER, http://www.catskillmountainkeeper.org/our-programs/fracking/whats-wrong-with-fracking-2/wastewater/ (last visited Feb. 2, 2015) (highlighting dangers of wastewater in fracking and identifying failed methods of protecting environment from fracking wastewater disposal).

28. *See Wastewater Treatment, Water Use*, *supra* note 25 (discussing harmful side effects of untreated wastewater on environment and human health). Negative effects on the environment include excessive nutrients, which can be toxic to organisms and lead to a decline in certain species; and an increase in disease-causing bacteria in the water that would limit beaches, drinking water, and other human recreation. *See id.*

29. *See id.* (discussing pollutants in water bodies due to improper wastewater treatment and impact on ecosystem).

harmful materials.[30] Wastewater treatment undergoes specified levels of treatment based on the amount of solids removed and the oxygen placed back into the water, a process known as "aerating."[31] "Primary treatment" refers to the first process in wastewater treatment; this process removes many of the solids suspended in the wastewater and eliminates about fifty to sixty percent of solids in the water.[32] "Secondary treatment" continues to remove solids through the use of microbes, while also aerating the wastewater; this process ultimately results in removing approximately eighty-five percent of solid impurities from the water.[33] Additionally, further processes, called "tertiary treatments," may be employed to clean the water, and include procedures such as incorporating chlorine into the water or utilizing expensive technology.[34] Tertiary treatments "can remove more than [ninety-nine] percent of all the impurities" in the water, resulting in water that is almost potable.[35]

Once the wastewater is treated and meets government-mandated levels of cleanliness, the water is then either released back into nature or utilized by society.[36] The implemented applications to treat wastewater seem to be limitless, as technology has excelled in permitting heightened levels of cleanliness.[37] The treated wastewater is generally used for non-potable, purposes.[38] For over 100 years, society has treated and used wastewater in agriculture, land-

30. *See id.* (concluding treatment of wastewater is effective in preventing harmful wastewater materials from negatively impacting ecosystem).

31. *See id.* (reviewing methods of treating wastewater and identifying aerating successful treatment option). The levels of wastewater treatment discussed here refer to "primary" and "secondary" treatment; other classifications exist and will be further discussed. *Id.*

32. *See Introduction to Wastewater Treatment Processes*, WORLD BANK GROUP, http://water.worldbank.org/shw-resource-guide/infrastructure/menu-technical-options/wastewater-treatment (last visited Feb. 2, 2015) (elaborating detailed processes of primary treatment of wastewater).

33. *See id.* (discussing secondary treatment process of wastewater); *see also Wastewater Treatment*, CITY OF PHILA., http://www.phila.gov/water/wu/wastewater/Pages/WastewaterTreatment.aspx (last visited Feb. 2, 2015) (discussing water treatment standards used in Philadelphia region).

34. *Introduction to Wastewater Treatment Processes*, *supra* note 32 (discussing advanced treatments used for purifying wastewater).

35. *Id.* (elaborating on effectiveness of advanced treatments on success of purifying wastewater).

36. For a discussion of the various uses and correlating standards for wastewater reuse, see *infra* notes 164-206 and accompanying text.

37. For a discussion of the technology and procedures used in wastewater treatment, and effectiveness of the wastewater treatments, see *supra* notes 25-35 and accompanying text.

38. *See Water Recycling and Reuse: The Environmental Benefits*, EPA, http://www.epa.gov/region09/water/recycling/#uses (last updated Sept. 30, 2015) [hereinafter *Water Recycling and Reuse*] (discussing various uses for treated wastewater).

scaping, golf course irrigation, cooling water for power plants and refineries, artificial lakes, construction activities, and "industrial process water for such facilities as paper mills. . . ."[39]

Another use of wastewater, achievable due to the advances in purification technology, indirectly serves as potable drinking water.[40] Many projects supplement water reservoirs with treated wastewater by using advanced purification processes such as "microfiltration, reverse osmosis, [ ] ultraviolet and hydrogen peroxide treatment[,]" which treats wastewater to a level that meets state and federal drinking water standards.[41] Orange County, California, is highly regarded for its success in adopting these treatments to utilize wastewater as drinking water for over 500 thousand people.[42] The World Health Organization (WHO) also maintains standards to adopt proper treatments converting wastewater to potable water and to control the occurrence of water-borne diseases.[43]

Despite dangerous substances found in wastewater, proper treatment helps make utilizing wastewater a generally safer practice.[44] As demonstrated, society uses treated wastewater for different activities; therefore, treatment level requirements ensuring

39. *See id.* (discussing historical uses of wastewater); *see also Austin Water History*, AUSTIN WATER, http://www.austintexas.gov/department/water-and-wastewater-history (last visited Feb. 2, 2015) (providing historical examples of wastewater reuse in society).

40. *See Water Recycling and Reuse*, *supra* note 38 (revealing new potable uses of treated wastewater); *see also Guidelines for Drinking-water Quality*, WHO (2008), *available at* http://apps.who.int/iris/bitstream/10665/44584/1/9789241548151_eng.pdf (identifying requisite water standards to prevent water-borne diseases and protect against harmful substances in treated water).

41. *See Water & Efficiency in Water and Wastewater Facilities*, EPA, http://www.epa.gov/region9/waterinfrastructure/orange-county.html (last updated Aug. 29, 2015) (reviewing treatments to obtain potable drinking water quality in Orange County, California).

42. *See id.* (commending Orange County's use of treated wastewater). Orange County won the Water Efficiency Leader Award for this technique and application of these purification processes for wastewater reuse. *See id.*

43. *See Guidelines for Drinking Water Quality*, *supra* note 40, at 3 (identifying standards for treated wastewater to prevent harm to ecosystem and human health). Examples of toxic substances the WHO incorporates in its potable drinking water standards include lead, arsenic, and chromium. *See id.* at 172-73. The WHO established limits on the maximum allowable concentration of chemicals in the water through these standards. *See id.* Other elements with maximum limits include Selenium, Cyanide, Cadmium, and Barium. *Id.* Some other factors identified by the WHO to determine potability include measuring the total solids within the water, measuring zinc and iron, the taste and odor, and the acidity (pH) range. *See id.* at 174. Other chemical substances affecting potability listed by the WHO include iron, manganese, copper, zinc, calcium, magnesium, sulfate, chloride, and organic pollutants. *See id.* at 174.

44. For a discussion on how treatments purify the water, see *supra* notes 30-35 and accompanying text.

safety may differ among various uses.[45] Due to the dangers addressed in this section and elaborated on in the following sections, governments must enact more adequate standards to ensure water is safe for the respective use, such as setting stringent standards for potable drinking water.[46]

III. IMPACTS TREATED WASTEWATER HAS ON THE ENVIRONMENT: HOW SAFE IS WASTEWATER-BASED SNOW AND WHAT LAWS PROTECT US?

This section discusses the growing trend of using treated wastewater for snowmaking and highlights a few of the potential benefits and drawbacks of using treated wastewater for this purpose.[47] The Arizona Supreme Court heard a case in 2008 regarding the Snowbowl ski resort, which was planning to implement treated wastewater in its snowmaking process.[48] The majority opinion did not address the potential impacts of making snow with wastewater and dismissed that portion of the complaint; the dissenting opinion, however, included an in-depth discussion of using treated wastewater to make snow.[49] Further, the Environmental Protection Agency (EPA) this growing trend and now incorporates discussions of relevant state laws in its 2012 Guidelines for Water Reuse.[50]

A. How Wastewater Became Utilized for Snowmaking

The changing climate has led the ski industry into a drier era, resulting in less natural snow to rely upon throughout the winter season.[51] Even the EPA has observed that "natural precipitation will not otherwise support a longer recreation season" for ski areas

45. For a discussion of how wastewater is used and different standards already implemented, see *supra* notes 23-46 and accompanying text.

46. *See Guidelines for Drinking Water Quality*, at 8-18, *supra* note 40 (discussing how WHO mandates rigorous standards for wastewater treatments).

47. For a discussion of using the benefits and drawbacks of using treated wastewater for snowmaking, see *infra* notes 75-125 and accompanying text.

48. For a discussion of the Arizona court's analysis on using treated wastewater for snowmaking, see *infra* notes 126-163 and accompanying text.

49. For a discussion of the 2008 Arizona case that addresses snowmaking with wastewater, see *infra* notes 127-163 and accompanying text.

50. For a discussion of the EPA's guidelines, see *infra* notes 171-206 and accompanying text.

51. *See 2012 Guidelines for Water Reuse*, EPA, 3-14 (Sept. 2012), *available at* http://nepis.epa.gov/Adobe/PDF/P100FS7K.pdf [hereinafter *2012 Guidelines*] (discussing why states are making snow with treated wastewater). For example, Cloudcroft, New Mexico resorted to transporting potable water to satisfy its needs, which include a ski area, due to severe drought and decided to rely on treated reclaimed water instead. *See* Don Vandertulip, *Snowmaking with Reclaimed Water*, RECLAIMED WATER, D-126-28 (2012), *available at* http://www.reclaimedwater.net/

without additional snow.[52] Historically, society used treated wastewater for golf course and farm irrigation.[53] Wastewater has also been used for drinking water, after being treated to a heightened level of cleanliness.[54] More recently, however, ski resorts began utilizing wastewater as an alternative or supporting water source.[55] Currently, wastewater helps ease the ski industry's economic burden caused by a lack of natural snow.[56] For example, in January 2014, Arizona's Snowbowl ski resort confirmed that Snowbowl would be closed if it did not use wastewater to create the snow necessary to operate its resort; the forecast for February 2014 only expected just over a quarter inch of snow.[57] Snowbowl is the first ski resort to use 100 percent wastewater to create its snow.[58] This innovation raised many concerns regarding the practice of using wastewater to create snow.[59]

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data/files/195.pdf (outlining trend to make snow with wastewater throughout United States).

52. *2012 Guidelines*, *supra* note 51, at 3-14 (discussing why states using treated wastewater to make snow).

53. For a further discussion of how society used wastewater, see *supra* note 39 and accompanying text.

54. *See* Tom Marcinko, *Man-made Snow from Reclaimed Sewage at Heart of Hopi, Ski Resort Fight*, ALJAZEERA AM. (Feb. 9 2014, 5:00 AM), http://america.aljazeera.com/articles/2014/2/9/manmade-snow-fromreclaimedsewageat heartofhopiarizresortfight.html (discussing history of using treated wastewater in uncontroversial ways such as irrigation). Orange County, California, utilizes treated wastewater as drinking water. *See id.*; *see also* Mark Redwood, *Fact Sheet for the Research Community*, WHO (2006), http://www.who.int/water_sanitation_health/wastewater/research_audience_fs.pdf?ua=1 (reiterating importance of proper treatment of wastewater for healthy ecosystem).

55. *See* Marcinko, *supra* note 54 (identifying how ski resorts utilize reclaimed water).

56. *See id.* (discussing how treated wastewater helps ski industry and economy of Flagstaff, Arizona). Flagstaff is identified as a city dependent on tourism and would, therefore, feel the effects of an unsuccessful ski-season. *See id.* Although Flagstaff is geographically cold enough to experience snow, the city is experiencing drier winters, which affects both ski resorts and the merchants selling skis and snowboards. *See id.*

57. *See id.* (comparing likelihood of successful ski season with natural weather to likelihood of successful ski season with manmade snow). This weather forecast was for Flagstaff, which is located fourteen miles from Snowbowl. *See Flagstaff, AZ*, GOOGLE MAPS, https://www.google.com/maps/place/Flagstaff,+AZ/@35.1812076,-111.607959,12z/data=!3m1!4b1!4m2!3m1!1s0x872d8ef7da2e2631:0x8e1f3ca1cedbb300 (last visited Feb. 15, 2015) (indicating location of Flagstaff, Arizona on map).

58. *See* Marcinko, *supra* note 54 (distinguishing Snowbowl from previous ski areas that use treated wastewater to create snow).

59. For a discussion of the lawsuit against Snowbowl for using wastewater to create snow, see *infra* notes 126-163 and accompanying text. For a discussion of the publicity issues regarding Snowbowl's use of wastewater, see *infra* notes 75-77 and accompanying text.

This method, however, is not only utilized in the Southwest.[60] In the 2014-2015 ski season, Bear Creek Mountain Resort (Bear Creek), located in the Pocono Mountains of Pennsylvania, received a permit from the Pennsylvania Department of Environmental Protection (DEP) to use treated wastewater to make snow.[61] Bear Creek operates holding ponds, known as aquifers, in which treated wastewater is mixed.[62] The mixed water in the aquifer is then used to create the snow.[63] In addition, Bear Creek added an ultraviolet treatment to the purification process to better purify the wastewater.[64]

Pennsylvania addressed concerns similar to those of Snowbowl regarding its wastewater treatment process.[65] The DEP stated the standards for reusing water in this way are more stringent than typical land application projects.[66] Humans will inevitably ski on manmade snow, and thus come into contact with wastewater.[67] To this end, Bear Creek and the DEP stated that the "ultraviolet disinfection treatment step will eliminate the need for concern."[68] In addition to the ultraviolet process, Bear Creek's water treatment plant implements primary and secondary treatments.[69] Since 1999, Bear

60. For a discussion of the southwest's use of treated wastewater in their snow, see *supra* notes 51-59.

61. *See* Marcinko, *supra* note 54 (discussing history and process behind Bear Creek obtaining ability to create snow from wastewater).

62. *See id.* (identifying how Bear Creek will utilize treated wastewater and process for making snow).

63. *See Wastewater to be Used to Create Snow for Ski Resort*, ENVTL. TECHN. ONLINE (Nov. 18, 2013, 1:43 PM), http://www.envirotech-online.com/news/water-wastewater/9/breaking_news/wastewater_to_be_used_to_create_snow_for_ski_resort/27636/ (describing Bear Creek's plan to utilize treated wastewater for snowmaking).

64. *See* Linda Dailey Paulson, *Ski Resort Set to Make Snow from Treated Wastewater*, RWL WATER (Nov. 20, 2013), http://www.rwlwater.com/ski-resort-set-to-make-snow-from-treated-wastewater/ (describing Bear Creek's techniques to treat wastewater for snowmaking).

65. For a discussion of the anxieties experienced in Snowbowl, Arizona, see *infra* notes 75-77, 140-162 and accompanying text.

66. *See* Paulson, *supra* note 64 (discussing DEP's point of view on using treated wastewater for snowmaking).

67. *See Wastewater to be Used to Create Snow for Ski Resort*, *supra* note 63 (identifying higher likelihood of human contact with snow compared to other uses of treated wastewater). Concern over human contact stems from bacteria and other microorganisms that are present in the water if it is not treated through enhanced processes. *See id.*

68. *See* Paulson, *supra* note 64 (internal quotation marks omitted) (discussing Bear Creek's response to concerns regarding use of treated wastewater in making snow). For a discussion on wastewater treatments, see *supra* notes 30-35 and accompanying text.

69. *See* Ted J. Rulseh, *The Fire Chief Project: Pure as the Driven Snow?* TREATMENT PLANT OPERATOR (Nov. 20, 2013), http://www.tpomag.com/blog/2013/11/the_

Creek spent an estimated $800,000 on these processes and the development of the wastewater treatment plant.[70] While this cost may seem high, the treatment plant could be worth the cost if it ultimately results in more revenue based on longer ski seasons at the resort.[71]

Further, the resort is taking precautions of limiting human contact with the treated wastewater; for example, it will make snow at night when skiers are not on the slopes.[72] Moreover, the pipes used to transfer the artificial snow will be cleaned each day.[73] If these and other precautions are required to support the safety of individuals, many skiers may wonder how safe the reuse of wastewater for snowmaking truly is and whether the standards are stringent enough to ensure their safety as well as environmental safety.[74]

B. Potential Risks and Benefits Arising from the Use of Wastewater-based Snow

Using sewage to create artificial snow creates an undeniable "yuck factor."[75] Arizona's Snowbowl dealt with this stigma when journalists claimed the snow was yellow due to the sewage; Snowbowl's general manager, however, explained that the snow was discolored because of rust in the pipes that transported the water and snow.[76] Snowbowl displays many signs throughout the resort cautioning skiers to avoid consuming the snow, which serves to foster the "yuck factor" stigma.[77] Despite the stigma, Snowbowl satisfied the cleanest wastewater level of "class A+" in Arizona.[78] This

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fire_chief_project_pure_as_the_driven_snow (discussing treatments applied by Bear Creek to treat wastewater).

70. *See id.* (explaining cost of wastewater treatment).

71. For a discussion on the decrease in snow and its effects on ski resorts, see *supra* notes 51-70 and accompanying text.

72. *See* Rulseh, *supra* note 69 (discussing how Bear Creek will strive for safety when using treated wastewater).

73. *See id.* (detailing Bear Creek's enhanced policies adopted to ensure safety of using treated wastewater in snowmaking).

74. For a discussion on various public views on Snowbowl using wastewater to create snow, see *infra* notes 124-146 and accompanying text. For a discussion on the laws associated with ensuring safety with clean water, see *infra* notes 163-205 and accompanying text.

75. *See* Marcinko, *supra* note 54 (addressing "yuck factor" stigma).

76. *See id.* (discussing how Snowbowl dealt with public stigmas regarding using wastewater for snow).

77. *See id.* (describing Snowbowl's safety precautions). The sign states: "TO CONSERVE NATURAL RESOURCES RECLAIMED WATER USED FOR SNOWMAKING [-] DO NOT DRINK." *Id.*

78. *See id.* (identifying Snowbowl's satisfaction of highest water standard).

classification, however, only indicated that the water was free of fecal coliform bacteria in four out of seven samples.[79]

There is merit to the health and environmental concerns for using treated wastewater in the creation of snow.[80] One valid concern is ensuring that the treatment facilities maintain compliance with applicable standards.[81] To ensure a treatment plant continues to purify the wastewater effectively, government officials must continuously monitor them.[82] Further, despite a plant engaging in high levels of treatment, the purification process is not perfect because some pathogenic organisms will remain in the wastewater.[83] Even in treated wastewater, analysts suggest that "pathogenic organisms are present and the use site must be managed in a manner that minimizes or eliminates the potential for disease transmission."[84] For example, Bear Creek addresses this concern by only making snow at night to minimize human contact.[85]

Another concern arises from the effects felt with the practice of fracking.[86] The American Chemical Society studied the impact on the wastewater that results from fracking.[87] The study demonstrated that even after passing through wastewater treatment plants,

79. *See* Marcinko, *supra* note 54 (discussing one standard to satisfy Arizona's water quality laws).

80. For a discussion of the health and environmental concerns related to treated wasterwater, see *infra* notes 75-107 and accompanying text.

81. *See* Pipeline, *On-Site Wastewater Disposal and Public Health*, PURDUE U. (1996), https://engineering.purdue.edu/~frankenb/NU-prowd/disease.htm (discussing general drawbacks to integrating treated wastewater into community). Pipeline also states that the community treatment systems raise concerns because it is aging infrastructure, susceptible to damage without constant repair and upgrading. *See id.* The damage can lead to further sources of pollution if there are cracks in the pipes and water contamination if exposed. *See id.*

82. *See id.* (discussing difficulty of ensuring compliance for treatment plants and need for repairing and upgrading).

83. *See Chapter 2 – Health Risks Associated with Wastewater Use*, FAO, http://www.fao.org/docrep/W5367E/w5367e04.htm#guidelines (last visited Sept. 4, 2015) (discussing how to protect public health when using treated wastewater and identifying how contaminants reach ecosystem).

84. *See id.* (suggesting methods to combat drawbacks of reusing wastewater).

85. For a discussion on how Bear Creek uses wastewater in its snow creation, see *supra* notes 60-74 and accompanying text.

86. *See 'Fracking' Wastewater that is Treated for Drinking Produces Potentially Harmful Compounds*, AM. CHEMICAL SOC'Y (Sept. 24, 2014), http://www.acs.org/content/acs/en/pressroom/presspacs/2014/acs-presspac-september-24-2014/fracking-wastewater-that-is-treated-for-drinking-produces-potentially-harmful-compounds.html (identifying wastewater especially harmful when derived from fracking).

87. *See id.* (analyzing effects on wastewater from fracking).

the resulting water might nevertheless be unsafe.[88] Substances such as highly radioactive material, heavy metals, and salts are not cleared from the water.[89] More specifically, the leftover salts and heavy metals react with the traditional treatments, which results in toxic byproducts.[90] Further, some chemicals can survive the filtration and purification processes in low concentrations.[91] Unfortunately, these chemicals, even in low concentrations, can still be harmful.[92]

Human health, however, is not the only concern; some research demonstrates the leftover chemicals can also negatively impact the environment.[93] One example is found in endocrine disrupting chemicals (EDCs).[94] EDCs are present in many household products that end up in wastewater originating from homes.[95] These products include items such as "detergents, soaps, plastics, food, and personal care products such as fragrances."[96] While the ecological impacts of EDCs are still being researched, one negative impact EPA researchers are confident of is EDCs' effect on certain aquaculture.[97] The EPA researchers found that EDCs cause "feminization of fish populations downstream of treatment plants."[98] In connection with the EPA, the Department of Fisheries and Oceans Canada studied how chronic exposure to low concentrations of these chemicals affected a lake's minnow population.[99] The study showed chronic exposure led to defects in the reproductive devel-

88. *See id.* (concluding regular treatment insufficient to treat wastewater derived from fracking). The typical water treatment facilities do not remove heavy metals and salts known as "halides." *See id.* The American Chemical Society recommends either equipping water treatment facilities with halide removal or stopping the discharge of fracking wastewater to surface waters. *See id.*

89. *See id.* (identifying harmful substances that may remain after treatment).

90. *See id.* (describing how harmful substances can have detrimental consequences).

91. *See Assessing Endocrine Disrupting Chemicals in Landfills, Solid Waste Sites and Wastewater*, EPA, http://www2.epa.gov/chemical-research/assessing-endocrine-disrupting-chemicals-landfills-solid-waste-sites-and (last updated Mar. 31, 2015) [hereinafter *Assessing Chemicals*] (identifying issues that remain even after treatment).

92. *See id.* (identifying remaining material left in treated wastewater can still be harmful).

93. *See id.* (elaborating on types of harms resulting from treated wastewater).

94. *See id.* (identifying chemicals harmful to environment).

95. *See id.* (identifying origination of harmful substances in wastewater).

96. *Ecosystems & Environment: Wastewater Treatment*, EPA, http://dbwt.us/cbnswwtp/A1-EPA-Ecosytems-&-Environment-Wastewater-Treatment.pdf (last visited Dec. 20, 2015) (identifying leftover materials potentially found in wastewater).

97. *See id.* (describing lack of statistics and research available in this area and identifying area of credited research).

98. *Id.* (pointing out proven ecological effect of these chemicals).

99. *See id.* (elaborating on research of chemicals by other organizations).

opment of both male and female fish.[100] These defects almost led to the minnow species becoming extinct in the lake.[101] Even treated wastewater, therefore, can disrupt the environment.[102]

Excess nutrients can also pose an issue for snowmelt.[103] Snowmelt is water runoff that results from the melting snow and generally flows into the rivers and reservoirs in the surrounding areas.[104] Due to its high phosphorus content, the EPA cautions against snowmelt in areas near sensitive bodies of water.[105] Small amounts of phosphorus promote growth of algae and other marine plants, which feeds the organisms living in the water.[106] Too much phosphorus, however, results in "nutrient pollution," which leads to rapid algae growth that suffocates the ecosystem and results in decreased water quality and food resources.[107]

These harms should not be the only considerations in the debate against the use of and standards for treated wastewater.[108] Despite the concerns identified, reusing treated wastewater also has many benefits.[109] As the human population increases, the need for clean water also increases and recycled water can help satisfy this demand for clean water by acting as a supplement or substitute.[110] Treated wastewater is especially beneficial in areas with long-term drought conditions, such as the western United States.[111] As previ-

100. *Id.* (stating conclusion of study on minnows habituating in treated wastewater).

101. *See Ecosystems & Environment: Wastewater Treatment*, *supra* note 96 (asserting detrimental consequences to minnows concluded in research).

102. *See id.* (summarizing effects of treated wastewater flowing into ecosystems).

103. *See 2012 Guidelines*, *supra* note 51, at 3-15 (identifying snowmelt as potential harm to ecosystem).

104. *See Snowmelt – The Water Cycle*, USGS, http://water.usgs.gov/edu/water cycles now melt.html (last modified Aug. 7, 2015, 1:58 PM) (defining snowmelt).

105. *See 2012 Guidelines*, *supra* note 51, at 3-15 (providing recommendations for how to respond to snowmelt).

106. *See The Problem*, EPA, http://www2.epa.gov/nutrientpollution/problem (last updated Aug. 3, 2015) (explaining nutrient pollution and how phosphorus is used by ecosystem).

107. *See id.* (defining "nutrient pollution" and identifying consequences of nutrient pollution).

108. For a discussion of the possible harmful effects that derive from treated wastewater, see *supra* notes 80-107 and accompanying text.

109. *See Water Recycling and Reuse*, *supra* note 38 (discussing benefits of reusing treated wastewater).

110. *See id.* (discussing increasing number of uses for treated wastewater). For a discussion of the uses of treated wastewater, see *supra* notes 36-40, 51-74 and accompanying text.

111. *See Water Recycling and Reuse*, *supra* note 38 (identifying reuse of wastewater particularly beneficial to western states).

ously discussed, California is beginning to rely heavily on reusing wastewater through purification treatments.[112]

Further, treated wastewater may also benefit ecosystems.[113] For example, treated wastewater as an additional source of water helps to "decrease the diversion of water from sensitive ecosystems."[114] Society diverts preexisting, natural water flows for its use, and reusing water can augment that demand; this practice would permit much of the natural water to flow to the ecosystems instead.[115] This augmentation of water supply also helps to preserve wetland habitats.[116]

Another beneficial consideration derives from reusing wastewater in local communities.[117] Wastewater treatment plants generally service local areas and, therefore, serve as a local source of water.[118] Extracting, treating, and transporting natural water over long distances to non-local areas can be expensive and may require a lot of energy.[119] Instead, the treated water can be used for activities that do not require high-quality water, which inevitably costs less and requires less energy because the water undergoes less rigorous treatment requirements.[120] Flushing a toilet, for example, requires a less stringent water quality than the quality that drinking water requires, and correspondingly, it also requires less energy to achieve the requisite standards of the former.[121] Governments and courts are still attempting to figure out how to best address which standards they should apply for different uses of wastewater.[122] Spe-

112. For a discussion on California's current drought conditions and how the state utilizes wastewater to compensate for the drought, see *supra* notes 7-10 and accompanying text.

113. *See Water Recycling and Reuse*, *supra* note 38 (demonstrating benefits associated with reuse of treated wastewater). For a discussion of the studied environmental drawbacks of recycling wastewater, see *supra* notes 75-107 and accompanying text.

114. *Water Recycling and Reuse*, *supra* note 38 (establishing that wastewater helps to maintain water supply).

115. *See id.* (showing that supplementing water bodies with treated wastewater is beneficial).

116. *See id.* (explaining beneficial consequences to surrounding ecosystems).

117. *See id.* (discussing benefits of water body being close to where it is ultimately used).

118. *See id.* (identifying where treated water is used).

119. *See Water Recycling and Reuse*, *supra* note 38 (identifying costs associated with treatment of water when facility is far away from final destination).

120. *See id.* (demonstrating local treatment plants save costs typically associated with treatment plants).

121. *See id.* (identifying differences in energy requirements associated with different uses of treated water).

122. For a discussion of the court case discussing the use of treated wastewater for creating snow, see *infra* notes 126-163 and accompanying text.

cifically, quasi-consumable activities, such as skiing, pose a new category of wastewater use for which governments and agencies must determine the necessary treatment requirements.[123]

The EPA, nevertheless, applauds ski industries that make snow with treated wastewater during the winter months because the cold weather conditions make it difficult to use the wastewater for other, more typical uses, such as irrigation.[124] The EPA also identifies that making snow from treated wastewater is a cost-saving exercise, as storing treated wastewater in snow piles avoids the costs associated with building surface reservoirs.[125]

C. Has the Court Iced the Idea of Snowmaking with Wastewater or Let it Slide?

In *Navajo Nation v. United States Forest Service*,[126] the Ninth Circuit Court of Appeals considered whether it was appropriate to use wastewater to create snow for skiing.[127] This portion of the Comment will first discuss the *Navajo Nation* case, and will subsequently analyze its effect on the ski industry's move towards utilizing wastewater for snow creation.[128] It will then proceed to explain government standards for treated wastewater.[129] Lastly, it will discuss how governments might proceed in addressing the standards required for the use of wastewater in quasi-consumable activities, such as skiing.[130]

In *Navajo Nation*, the United States Court of Appeals for the Ninth Circuit decided a claim brought by the Navajo Nation against the United States Forest Service, which sought to prohibit the use of wastewater for making artificial snow in the northern mountains

123. For a discussion regarding current laws and standards used for the treatment of wastewater for certain uses, see *infra* notes 164-206 and accompanying text.

124. *See 2012 Guidelines*, *supra* note 51, at 3-14 (identifying treated wastewater lacks uses in cold weather conditions).

125. *See id.* at 3-15 (elaborating on monetary benefits of using treated wastewater).

126. Navajo Nation v. U.S. Forest Serv., 535 F.3d 1058 (9th Cir. 2008).

127. *See id.* at 1062 (stating issue in case centers on Navajo's request for court to prohibit government group from using artificial snow at Arizona ski mountain).

128. For a discussion on the court's analysis, see *infra* notes 131-163 and accompanying text.

129. For a discussion of the laws and regulations relating to quality standards for snowmaking with treated wastewater, see *infra* notes 164-206 and accompanying text.

130. For a discussion on what to expect from government and the ski industry in the future, see *infra* notes 207-221 and accompanying text.

of Arizona, and specifically the Snowbowl ski resort.[131] Snowbowl is a ski resort located in Northern Arizona and operates within the Coconino National Forest.[132] With hopes of creating a more stable and reliable snowfall for the business, Snowbowl submitted a request to the United States Forest Service proposing to use recycled wastewater in its artificial snowmaking process.[133] The wastewater Snowbowl planned to use in creating artificial snow had obtained an "A+" classification by the Arizona Department of Environmental Quality (ADEQ), which, as mentioned above, is the highest classification for treated wastewater available in Arizona; this classification is also applied to processes such as irrigating school ground landscapes and food crops.[134] Wastewater used for purposes like irrigation, however, does not carry the same likelihood of direct human contact, as does using wastewater in ski resorts.[135] The Forest Supervisor approved the proposal and proceeded to issue a Final Environmental Impact Statement (FEIS).[136] Navajo Nation appealed this approval, but the Forest Service affirmed Snowbowl's proposal; in response, Navajo Nation filed an action against both Snowbowl and the Forest Supervisor in federal district court.[137]

The claims presented before the court were primarily analyzed under the Religious Freedom Restoration Act of 1993 (RFRA); this Comment, however, will focus on the claims filed under the National Environmental Policy Act of 1969 (NEPA).[138] The majority opinion focused on a mistake in the plaintiff's pleading in its NEPA claim and waived the plaintiff's claim that the FEIS failed to con-

131. *See Navajo Nation*, 535 F.3d at 1062 (identifying main issue in case).

132. *See id.* at 1064 (discussing geographical location of Arizona's Snowbowl ski resort).

133. *See id.* at 1065 (discussing process of Snowbowl pursuing use of treated wastewater in making snow). For a further discussion on how ski resorts respond to concerns surrounding the variability in snowfall, see *supra* notes 3-10, 55-74 and accompanying text.

134. *See Navajo Nation*, 535 F.3d at 1065 (describing application of Arizona's water quality standards).

135. *See id.* (identifying water quality requirements for snow in Arizona).

136. *See id.* at 1066 (discussing approval of Snowbowl proposal for use of wastewater).

137. *See id.* at 1066 (discussing procedural history of Navajo fighting use of treated wastewater on what it viewed as sacred grounds).

138. *See id.* (discussing origins of Navajo's claims under NEPA and RFRA). The Navajo also challenged the proposed wastewater use under other acts, such as the National Historic Preservation Act, the Endangered Species Act, the Grand Canyon National Park Enlargement Act, and the National Forest Management Act of 1976. *See id.* For the court's analysis of the Religious Freedom Restoration Act claims, see *id.* at 1066-78 (affirming judgment for government defendants on RFRA claim and concluding artificial wastewater use will have no substantial burden on exercise of Navajo religion).

sider the dangers wastewater-based snow poses to humans who may ingest the snow.[139] The three-judge dissent, however, reached the opposite conclusion regarding the dismissal of the NEPA complaint, and thus the dissent analyzed the NEPA complaint on its merits.[140]

The initial complaint claimed "the Forest Service violated NEPA by fail[ing] to take a hard look at the impacts of introducing reclaimed waste water to the ecosystem."[141] The plaintiffs also alleged the FEIS did not sufficiently "address the effects of soil disturbance, and the persistent pollutants in reclaimed water."[142] The claim specifically addressed by the dissenting judges was the health risk associated with ingesting artificial snow made from wastewater.[143] The Forest Service acknowledged this risk prior to releasing the FEIS, as evidenced by a question asked on the record; "[w]ill my kids get sick if they eat artificial snow made from treated wastewater?"[144] The Forest Service responded to this question by stating it would be analyzed pursuant to NEPA's requirements during the proposal-approval process.[145]

Although the ADEQ permits an "A+" classification of wastewater for snowmaking, the dissent points out that the ADEQ specifically censures the human ingestion of "A+" classified wastewater.[146] The law considers prohibited consumption to include "[h]uman

139. *See Navajo Nation*, 535 F.3d at 1079-80 (explaining why majority did not address NEPA claim). The Navajo did not raise this claim until its motion for summary judgment and the government defendants argued that the Navajo failed to include this claim in its initial complaint. *See id.* The Navajo moved to amend the complaint to add the new NEPA cause of action but the district court denied Navajo's request to amend the complaint. *See id.* The Navajo failed to timely appeal this district court's denial and thus, the appellate court majority did not discuss this claim. *See id.*

140. *See id.* at 1108-10 (Fletcher, J., dissenting) (refusing to dismiss important NEPA claim based on minor filing error and explaining Navajo's complaint was sufficient to assert claim).

141. *Id.* at 1108 (internal quotation marks omitted) (assessing history of claims in Navajo's complaint about Forest Service's violation of NEPA).

142. *See id.* (internal quotation marks omitted) (detailing initial claims filed by Navajo).

143. *See id.* (providing support for Navajo's claim of risk from ingesting snow made of reclaimed wastewater).

144. *See Navajo Nation*, 535 F.3d at 1108 (Fletcher, J., dissenting) (internal quotation marks omitted) (providing rationale to demonstrate FEIS's concern over treated wastewater in snow).

145. *See id.* at 1109 (showing how FEIS claimed it planned to investigate effects of treated wastewater on community).

146. *See id.* 1110 (demonstrating contrary evidence to FEIS's claim that there should be no concern over health effects of treated wastewater in snow). For a description of the necessary requirements to meet the "A+" standard, see *infra* note 193 and accompanying text.

consumption, full-immersion water activity with a potential of ingestion, and evaporative cooling or misting" of reclaimed water.[147] The Arizona law further describes the requirements for users of wastewater and identifies the types of contact with wastewater that it considers hazardous.[148] The criteria focus on the likelihood that humans will come into contact with the wastewater product.[149] Under Arizona law, users of reclaimed water are required to engage in "application methods that reasonably preclude human contact, including preventing contact with drinking fountains, water coolers, or eating areas, and preventing the treated effluent from standing on open access areas during normal periods of use."[150]

Further demonstrating the hazards of utilizing wastewater to create artificial snow, the law requires ski resorts to post signs throughout the resort warning skiers that reclaimed water is used to create the snow and snow should not be ingested.[151] The FEIS was also asked "how much exposure to the snow would be sufficient to make a person ill" as well as "how long it would take to see adverse effects on plants and animals downstream."[152] The only response the FEIS voiced to these concerns was "the proposed use of reclaimed water for snowmaking represents a low risk of acute or chronic adverse environmental impact to plants, wildlife, and humans."[153]

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147. *See Navajo Nation*, 535 F.3d at 1110-11 (Fletcher, J., dissenting) (internal quotation marks omitted) (defining consumption for purposes of treated wastewater); *see also* ARIZ. ADMIN. CODE § R18-9-704(G) (2005) (explaining general requirements and prohibited activities involving direct reuse of reclaimed water).

148. *See Navajo Nation*, 535 F.3d at 1111 (Fletcher, J., dissenting) (applying requirements of Arizona law to quality of wastewater in snowmaking); *see also* ADMIN. § R18-9-704(G) (warning how human consumption of wastewater or activities leading to likelihood of human consumption are prohibited).

149. *See* ADMIN. § R18-9-704(G) (explaining how full immersion activities in water are hazardous because of potential ingestion of wastewater).

150. *See Navajo Nation*, 535 F.3d at 1111 (Fletcher, J., dissenting) (internal quotation marks omitted) (discussing Arizona's requirements to protect community from dangers of treated wastewater); *see also* ADMIN. § R18-9-704(F) (listing ways irrigation users can avoid ingesting reclaimed water).

151. *See Navajo Nation*, 535 F.3d at 1111-12 (Fletcher, J., dissenting) (identifying examples of how resorts are expected to caution skiers); *see also* ADMIN. § R18-9-704(H) (explaining how signs must be used to warn public of presence of reclaimed water).

152. *See Navajo Nation*, 535 F.3d at 1111 (Fletcher, J., dissenting) (internal quotation marks omitted) (identifying due diligence expected of FEIS). For a further discussion of the pre-filtration and post-filtration dangers of wastewater-based snow, see *supra* notes 80-107 and accompanying text.

153. *See Navajo Nation*, 535 F.3d at 1111-12 (Fletcher, J., dissenting) (internal quotation marks omitted) (stating FEIS's brief response to concerns over reclaimed water ingestion).

The FEIS documented another public concern in keeping children from accidentally consuming snow; although signs warn against human consumption, children consuming snow is inevitable, such as in the event of a skiing wreck.[154] The dissent critiqued the FEIS's response to this concern, which alleged that because the ADEQ approved the use of wastewater, FEIS could assume incidental contact was considered by the ADEQ during its internal approval process.[155] Further, FEIS's only real response to the concern reminded those concerned "it is the responsibility of the visitor or the minor's guardian to avoid consuming snow made with reclaimed water."[156] Because the report was designed to analyze risks, the dissenting judges concluded the FEIS's above-referenced response was inadequate.[157] In Judge Fletcher' dissenting opinion, he emphasized the FEIS's response does not actually answer the question of whether ingested snow made from wastewater is safe.[158] Additionally, the dissent observed that no evidence exists to suggest the ADEQ actually analyzed the risk involved with ingesting the wastewater-based snow.[159] Thus, the dissent did not find that the FEIS's response sufficiently demonstrated the use of the treated wastewater snow is safe to use.[160]

The dissent's discussion of the environmental effects of wastewater-based snow suggests that if the Navajo's NEPA claim was not waived due to procedural issues, the majority may have ruled against the use of wastewater for the production of snow.[161] Courts, undoubtedly, are not adept to make decisions regarding environmental impacts of wastewater; the dissenting opinion, however, makes clear that courts should hold agencies accountable to ade-

154. *See id.* at 1112 (noting concern in community over likelihood of human consumption of reclaimed water).

155. *See id.* (disapproving of FEIS's blind assumption that ADEQ tested skiers' risk of ingestion).

156. *Id.* (internal quotation marks omitted) (providing FEIS's response to question regarding how children will be deterred from consuming snow made with wastewater).

157. *See id.* (disapproving of FEIS's placing burden on skiers to ensure safety, rather than that of snowmakers and water treatment facilities).

158. *See Navajo Nation*, 535 F.3d at 1112 (Fletcher, J., dissenting) (expressing disapproval of defendant's problematic and insufficient response to public concern).

159. *See id.* (analyzing adequacy of support from DEQ establishing safety).

160. *See id.* at 1112 (Fletcher, J., dissenting) (describing list of problems with FEIS's response). Specifically, the dissent found the FEIS's answer failed to address whether the artificial snow was harmful. *See id.*

161. *See id.* at 1080 (majority opinion) (comparing majority opinion to dissenting opinion).

quately researching and analyzing risks posed by the public.[162] Thus, in deciding whether to prevent the use of treated sewage effluent for artificial snow, a court should require an agency to further investigate what health effects exist for humans who may ingest treated wastewater.[163]

D. How Has the Government Responded to this New Use of Wastewater?

State and local governments have adopted various water quality standards for different uses of water.[164] For example, the minimum treatment levels and maximum bacteria counts permitted for irrigation of agriculture vary based on whether the crop is a consumable or non-consumable product.[165] International standards, however, do not exist due to the lack of research and data available to demonstrate the relationship between the quality of water after treatment and the resulting health effects.[166] The concern over which standards should be applied to the quasi-consumable category, which includes artificial snow, is a novel concept that has only recently become an issue, as evidenced by the only case to present the issue—*Navajo Nation*.[167] Recall, the WHO has developed standards for drinking water; utilizing treated wastewater for making snow is relatively new, however, as compared to the other uses of treated wastewater.[168] Consequently, governments have yet to update their local laws to incorporate which standards are specifically necessary for snowmaking.[169] Only thirty states have adopted regulations covering water recycling of wastewater, which demonstrates how novel this issue is in the United States.[170]

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162. *See id.* at 1113 (Fletcher, J., dissenting) (concluding defendant Forest Service did not provide reasonably thorough discussion of risks public posed regarding human ingestion of wastewater-based snow).

163. *See id.* at 1112 (discussing need for Forest Services to have provided further investigative efforts of wastewater hazard).

164. *See Chapter 2 – Health Risks Associated with Wastewater Use*, *supra* note 83 (discussing public health protection during wastewater use).

165. *See id.* (providing factors for determining quality standards for wastewater treatment).

166. *See id.* (discussing difficulty in determining water quality treatment requirements for uses).

167. For a discussion of *Navajo Nation*, see *supra* notes 126-163 and accompanying text.

168. For a discussion about the history of using treated wastewater in snowmaking, see *supra* notes 47-74 and accompanying text.

169. For a discussion of the EPA guidelines, see *infra* notes 171-206 and accompanying text.

170. *See Water Recycling and Reuse*, *supra* note 38 (identifying how not all states have adopted snowmaking water quality regulations).

Further, in the EPA's 2004 Guidelines for Water Reuse, applying water reuse to snowmaking was only mentioned once—in an appendix discussing Arizona's use classification system.[171] Moreover, in the description of Arizona's law, the snow, which has a high probability of human contact, is categorized in the same manner as landscape irrigation, toilet flushing, and fire protection systems; in comparison to snow, however, these practices have a small chance of human contact.[172]

Contrary to the little attention wastewater-based snow received from the EPA's Guidelines in 2004, the 2012 EPA Guidelines for Water Reuse showed an increased focus on this new use.[173] Additionally, the 2012 Guidelines devoted more care to discussing the application of recycled water to snowmaking.[174] While the 2004 Guidelines only mentioned snowmaking in a small portion of the appendix, the 2012 Guidelines dedicated nearly three pages to discussing snowmaking as a recreational reuse of water.[175]

This section of the EPA Guidelines specifically addressed what kind of standards should be implemented for snowmaking.[176] The EPA thus discussed the differing methods of handling treatment standards.[177] The EPA recognized that some states classify snowmaking as an "urban reuse," while other states categorize snowmaking for "recreational purposes."[178] This "recreational purposes" category includes the group that has potential body contact, called "recreational impoundments."[179] The EPA cited this difference as the main cause for including a snowmaking section in these updated guidelines.[180]

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171. *See 2004 Guidelines for Water Reuse*, EPA, 288 (Sept. 2004), *available at* http://nepis.epa.gov/Adobe/PDF/30006MKD.pdf (describing varying water quality standards across states).

172. *See id.* (describing Arizona's water quality requirements).

173. *See 2012 Guidelines*, *supra* note 51, at 3-14 (discussing standards for treated wastewater used in snowmaking).

174. *See id.* (comparing updated 2012 Guidelines to older 2004 Guidelines).

175. *See id.* (adding substantial recommendations for snowmaking with treated wastewater).

176. *See id.* (providing recommendations and summaries of state laws regarding snowmaking).

177. *See id.* (identifying lack of uniform regulations for snowmaking with treated wastewater).

178. *See 2012 Guidelines*, *supra* note 51, at 3-14 (noting differences between snowmaking quality laws throughout United States).

179. *See id.* (defining "recreational purposes").

180. *See id.* (reasoning why snowmaking section is now included in 2012 Guidelines).

The EPA commended the practice of utilizing treated wastewater to make snow by mentioning the lack of other uses for wastewater during winter months.[181] Due to winter weather conditions, it is often difficult to use treated wastewater for the typical purposes such as irrigation; thus, snowmaking provides a seasonal use for the treated wastewater.[182]

If ski resorts engage in snowmaking with treated wastewater, in its Guidelines, the EPA recommended that society take further precautions.[183] The EPA also recommended wastewater snow piles be kept away from sensitive water bodies.[184] Further, the EPA directed the user to quantify the snowmelt in different potential scenarios so that snowmelt is properly managed.[185] To accomplish proper management of snowmelt, the EPA guidelines discussed typical density and volume of the snow so that the user can manage snowmelt properly.[186] This is because too much snowmelt could overflow the reservoirs and cause flooding.[187]

Although these guidelines are informative, they are nevertheless only guidelines and it is up to the states to develop and implement the laws in which to follow.[188] The EPA's Guidelines discussed a few of the laws implemented in states regarding the creation of snow with reclaimed water.[189] Currently, if snowmaking is addressed by a state, it is listed in the "unrestricted impoundments"

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181. *See id.* (discussing benefits and drawbacks of using wastewater for snowmaking activities). The EPA specifically notes that "in areas where the temperatures are low enough to maintain water in the form of snow but natural precipitation will not otherwise support a longer recreation season," wastewater should be used for snowmaking. *Id.*

182. *See id.* (mentioning benefit of using treated wastewater in snowmaking process).

183. *See 2012 Guidelines*, *supra* note 51, at 3-15 (providing suggestions for maintaining safe conditions to readers making snow with treated wastewater).

184. *See id.* (cautioning against improperly storing snow made from treated wastewater). The EPA explains that snow treated with wastewater may contain high levels of phosphorous and should be stored so that it will not enter a sensitive body of water. *See id.*

185. *See id.* (explaining necessity of considering density and depth of accumulated snow in planning storage). According to the EPA, "[an acre-foot] (1,200 m3) of medium-density snow (1 [acre] with 1 foot of snow on it) has an equivalent water volume of approximately 146,000 gallons (550 m3)." *Id.*

186. *See id.* (identifying details regarding snowmelt and how to store snow piles made from treated wastewater).

187. *See id.* (discussing possible consequential effects of snow made from wastewater melting).

188. *See 2012 Guidelines*, *supra* note 51, at 3-15 (considering effectiveness of EPA's guidelines without states adhering to them).

189. *See id.* at 3-16 (discussing snowmaking regulations in Arizona, California, Colorado, Maine, New Hampshire, and Pennsylvania).

category of water reuse.[190] The EPA developed classifications based on many factors, such as the likelihood of public exposure and the degree of treatment necessary.[191] The "unrestricted impoundments" use is defined as "the use of reclaimed water to irrigate crops that are either processed before human consumption or not consumed by humans."[192]

One example of a state implementing substandard regulations to address the quality of treated wastewater is Arizona's law stipulating reclaimed water for snow must have "no detectable fecal coliform organism in four of the last seven daily reclaimed water samples[;]" thus, three out of the seven samples could have fecal organisms detected in the snow and still pass the quality standard.[193] A surprising example is Colorado, which has no regulations for snowmaking despite the abundance of ski areas located within Colorado.[194] Maine—another state that utilizes wastewater for snowmaking—has no snowmaking water quality rules, and no regulations regarding snowmaking; it does, however, have an alternative to ensuring quality of wastewater used to make snow.[195] To compensate for Maine's lack of snowmaking regulations, the Maine Department of Environmental Protection issues wastewater discharge permits for users who wish to make snow with the wastewater.[196]

Additionally, both New Hampshire and Pennsylvania have notable laws in the field of wastewater regulation.[197] According to the EPA Guidelines, New Hampshire has the most well-developed snowmaking rules.[198] New Hampshire establishes detailed methods of treating the effluent water and further identifies which criteria needs to be met based on the end use of the snow-refilling reser-

190. *See id.* at 4-8 (discussing snowmaking regulations throughout United States).

191. *See id.* at 4-24 (detailing considerations for identifying different categories of wastewater uses).

192. *See id.* at 1-4 (defining "unrestricted impoundments").

193. *See 2012 Guidelines*, *supra* note 51, at 3-15 (summarizing Arizona's water quality standards for snowmaking).

194. *See id.* (summarizing Colorado's water quality standards for snowmaking).

195. *See id.* (summarizing Maine's water quality standards for snowmaking).

196. *See id.* (identifying alternative method of regulating snowmaking with wastewater).

197. *See id.* at 3-16 (describing various water quality laws across United States).

198. *See 2012 Guidelines*, *supra* note 51, at 3-16 (distinguishing New Hampshire's quality standards for snowmaking from other states' standards).

voirs or recreational purposes.[199] Surprisingly, although New Hampshire establishes detailed standards, it requires a higher quality of water for golf course irrigation than it does for snowmaking.[200] With a higher probability of human contact in snowmaking than in golf course irrigation, it is surprising that quality standards that include snowmaking would place snowmaking in a lower quality classification than golf irrigation.[201]

Similarly, Pennsylvania does not have regulations for snowmaking quality and instead issues a permit for snowmaking.[202] Various resorts, such as Seven Springs and Bear Creek, utilize treated wastewater in creating snow and, therefore, it is crucial for Pennsylvania to regulate this activity because the activity is no longer hypothetical, as is the case with other states that do not have ski areas engaging in wastewater-based snowmaking.[203] Pennsylvania requires similar standards as New Hampshire in treating wastewater: water must undergo secondary treatment, filtration, and disinfection with chlorine and UV light.[204] As is evident by the foregoing, states have many different methods of managing the use of effluent water for snowmaking activities.[205] There is no uniform method to enforce the safety of the wastewater and, further, no uniform quality standard.[206]

IV. IF LAWS ARE STUCK ON THE BUNNY SLOPE, WHERE DOES THIS TRAIL LEAD?

As established throughout this Comment, unpredictable snowfall and weather is a common problem ski resorts are facing, which is further exacerbated by global climate change.[207] The option to

199. *See id.* (noting detailed requirements and rationale for requirements in New Hampshire).

200. *See id.* (comparing New Hampshire's irrigation standards to its snowmaking standards).

201. *See id.* (noting peculiarity of maintaining lower standards for snowmaking than for irrigation).

202. *See id.* (comparing Maine's snowmaking quality standards to Pennsylvania's snowmaking quality standards).

203. For a discussion of geographic areas using treated wastewater to supplement snowmaking, see *supra* notes 55-74, *infra* note 216 and accompanying text.

204. *See 2012 Guidelines*, *supra* note 51, at 3-14-16 (summarizing Pennsylvania's snowmaking quality standards).

205. *See id.* (comparing various laws regarding snowmaking quality standards among United States).

206. *See id.* (summarizing various laws among states regarding snowmaking quality standards).

207. For a discussion of ski resorts' motivations for using reclaimed water for snowmaking, see *supra* notes 51-56 and accompanying text.

use wastewater as an alternative to depleting natural reservoirs when there is a lack of natural snow precipitation is understandably appealing to ski resorts.[208]

The controversy surrounding Snowbowl's exploitation of wastewater to develop snow led to ski areas reconsidering using wastewater in this way.[209] Flagstaff, another major ski resort, provided two reasons for its decision to not use wastewater as a source for snow: 1) the application for wastewater was submitted too late for the ski season; and 2) Snowbowl's use of treated wastewater resulted in wastewater-based snow being a controversial topic.[210] Contrary to Flagstaff's decision and despite the controversy, Bear Creek came to the opposite conclusion and began to implement the wastewater treatment system into its snowmaking.[211]

Aside from ski industries reacting on their own accord, government organizations have responded to this controversy as well, as demonstrated by the EPA Water Reuse Guidelines in 2012; however, more informed and stringent standards are still required.[212] First, not many states have adopted laws that specifically reference snowmaking and there are currently no international standards implemented by the WHO.[213] Second, more research is necessary to determine any harmful effects that may arise—both to the local ecosystems and to the people and animals that come into contact with the artificial snow.[214] In 2012, the EPA's Guidelines identified a lack of studies analyzing "human health effects . . . associated with exposure to snow made with reclaimed water."[215] Without more studies, it will be difficult to obtain a unified agreement on how wastewater should be treated for making snow, both nationally and

208. For a discussion on Arizona's motivations for using wastewater for snow, see *supra* notes 51-59 and accompanying text.

209. *See* Marcinko, *supra* note 54 (demonstrating how public perception will slow trend towards adding wastewater to snowmaking process). Marcinko specifically notes the "yuck factor" in explaining Snowbowl's use of wastewater. *Id.*

210. *See id.* (identifying hurdles for ski resorts to use treated wastewater for snowmaking).

211. For a discussion of Bear Creek using reclaimed water for snowmaking, see *supra* notes 60-73 and accompanying text.

212. For a discussion of current regulations addressing treatment of wastewater for snowmaking, see *supra* notes 164-206 and accompanying text.

213. For a discussion of current regulations addressing treatment of wastewater for snowmaking, see *supra* notes 164-206 and accompanying text.

214. *See 2012 Guidelines*, *supra* note 51, at 3-14-16 (identifying that research is required for law to develop in this area). For a discussion on some of the studies that have been completed, see *supra* notes 93-107 and accompanying text.

215. *See 2012 Guidelines*, *supra* note 51, at 3-14 (proposing reasons for lack of consistent and complete regulations throughout country and world).

internationally.[216] Further, the lack of uniformity among regulations, standards, and studies will continue to make it difficult for governments to determine whether snowmaking involves enough human contact to warrant implementing drinking water standards, as opposed to typical irrigation standards.[217]

In addition to Pennsylvania and Arizona using reclaimed water for snowmaking, states such as Maine and California, as well as countries such as Canada and Australia, have also begun to engage in this practice.[218] Due to extreme drought conditions, it is foreseeable that making snow from wastewater will become common in California.[219] Without further evidence suggesting that snow made from reclaimed water is harmful, governmental organizations and courts will continue to lack support for restricting or standardizing this quasi-consumable use of wastewater.[220] Without proper regulations to apply to this new practice, resorts will continue to abide by the minimal laws in existence.[221] Therefore, if undeterred by the origins of the snow, skiers will be happy to know this new trend will result in longer ski seasons than natural snowfall would otherwise provide.

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216. *See id.* (discussing lack of knowledge and research of relationship between health effects and wastewater-based snow).

217. For a discussion of concerns relating to reusing wastewater, see *supra* notes 75-125 and accompanying text. For a discussion on current laws relating to the standards of reusing wastewater, see *supra* notes 164-206 and accompanying text.

218. *See 2012 Guidelines*, *supra* note 51, at 3-14 (identifying geographic regions utilizing treated wastewater to develop snow).

219. For a discussion on the drought conditions in California, see *supra* notes 7-10 and accompanying text.

220. For a discussion on the dissenting court's analysis of the use of wastewater to create snow and the need for more research, see *supra* notes 146-163 and accompanying text.

221. For a discussion of current regulations addressing treatment of wastewater for snowmaking, see *supra* notes 164-206 and accompanying text.

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