To: District Ranger Rebecca “Bekee” Hotze
From: Charlie Condrat a Forest Hydrologist with the Uinta-Wasatch-Cache National Forest
Date: April 17, 2018

Bekee, from what I read, dog waste has very high levels of bacteria in it and other harmful microorganisms such as *Cryptosporidium* and *Giardia* that can survive under harsher conditions and for longer times than bacteria. Bacteria will continue to live if it remains wet. If dog waste is dry the bacteria will die. Dog waste has a high potential to cause bacterial pollution in streams if it is directly deposited or runoff water carries it into a stream.

It is nine miles from the Town of Alta to the Metropolitan Water District treatment plant. From the publication *Temporal Variation & Persistence of Bacteria in Streams* by Koirola et al. (2009), bacteria can survive in soil and bed sediments for an extended period of time, sometimes several months. Fecal coliform mortality decreases with colder water temperatures. It takes about 24 hours for water to flow from the headwaters to the water taps in Salt Lake City. Short-term persistence of bacteria is controlled by precipitation and long-term persistence is controlled by base flow. What this means is that storm events will produce a short-term influx of bacteria into streams and the low flow period allows bacteria to survive in the soil and bed sediments.

It is unclear whether Salt Lake Valley Health Department (SLVHD) intended that they were allowing dogs within the entire area of the Town of Alta when they knew that dogs were not allowed on Forest Service lands. We would need a variance from SLVHD to allow dogs on FS lands.

My recommendation is to not allow dogs on Forest Service lands for the following reasons.

- Surface water from the Little Cottonwood Canyon watershed is used as drinking water by residences in the Salt Lake Valley.
- In Watershed Regulation 14, Salt Lake Valley Health Department does not allow dogs in the watershed area east of Salt Lake City under 4.2.9 which states "To allow a dog to enter or to take a dog into, whether loose or on a leash, the watershed area, except as allowed under part 4.3.3 of this regulation."
- Currently, the Wasatch-Cache National Forest Plan directs the Forest to protect valuable water supplies. It states that the watershed desired future conditions is “The underlying premise of resource management in this Management Area is the need to provide long-term, high quality culinary water to the large urban population of the Salt Lake Valley. Salt Lake City owns all or the largest percentage of water rights in each of the Wasatch Canyons except Red Butte, and has congressionally delegated authority to protect the water supply. Congress also directed the Forest Service to administer designated watersheds in cooperation with Salt Lake City for the purpose of storing, conserving and protecting water from pollution.”
- On Forest Service lands, Little Cottonwood Creek is under the State anti-degradation policy that states: *3.1 Maintenance of Water Quality - Waters whose existing quality is better than the established standards for the designated uses will be maintained at high quality unless it is determined by the director, after appropriate intergovernmental coordination and public participation in concert with the Utah continuing planning process, allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. However, existing instream water uses shall be maintained and protected. no water quality degradation is allowable which would interfere with or become injurious to existing instream water uses.*

- There is an added cost to remove bacteria by the water district treatment plant. Harmful microorganisms such as *Cryptosporidium* and *Giardia* are more difficult to remove and involve coagulation pre-treatment, filtration, and disinfection.

2.6. "Permitted watershed dog" shall mean a dog wearing a tag properly issued by Salt Lake County Division of Animal Services which authorizes the dog to be in the watershed.

4.3. **Requirements and Procedures For Keeping Dogs within Watershed Areas.**

4.3.1. The prohibition of dogs within watersheds specified in part 4.2.9 shall not apply to service dogs, permitted watershed dogs, search and rescue dogs, or to dogs used in law enforcement work while acting in their respective official capacities. Owners of these dogs, however, shall properly dispose of any fecal matter deposited by the dog.

4.3.2. Dogs licensed in the town of Alta may be maintained by their owners within the corporate limits of that community.

4.3.3. The keeping of a permitted watershed dog within Salt Lake County watershed areas shall occur only in accordance with the following requirements:

(i) The applicant shall submit to the Salt Lake County Division of Animal Services certification of property ownership, or if lessee, written owner approval.

(ii) The applicant shall submit for Department approval the proposed method of housing the dog in the watershed. All permitted watershed dogs shall be kept in an appropriate enclosure, i.e., a walled or fenced area on the owner's property. The enclosure shall be maintained at least 100 feet away from any watercourse and in no event less than 50 feet away from the watercourse.

(iii) Dog enclosures located within watershed areas are subject to inspection by the Department and shall be kept clean and sanitary at all times.

(iv) Applicant shall submit to the Department the proposed method of animal waste disposal. Fecal waste shall be disposed of daily in an approved way, to prevent contamination of the watershed area.

(v) Applicant shall sign a written statement signifying that he or she agrees to the following:

a. The enclosure used for the keeping of the dog shall be maintained clean and sanitary at all times.

b. All dog fecal waste shall be cleaned up daily and disposed of in an acceptable way.

c. The dog shall not be allowed off the owner's property, even if it is on a leash, except when it is entering or leaving the property to or from a vehicle. At these times, the animal shall be on a leash.

d. The dog shall be fitted with a subdermal identification microchip and shall wear permitted watershed dog designation tags issued by Salt Lake County Animal Services at all times.

e. The applicant is subject to Salt Lake County Animal Control Regulations and Department Watershed Regulations.

(vi) The applicant shall pay a special permit fee to the Salt Lake County Division of Animal Services for the keeping of the animal in the watershed area. Prior to the issuance of such permit, the applicant shall also submit to the Division of Animal Services a surety bond or cash in the amount of $100.00 to ensure compliance with these regulations. Any dog permit holder who is found to be in violation of this regulation, shall forfeit his dog permit and the required bond. The permit holder may also be subject to other fines and

penalties as required by law. Should an applicant whose permit and bond have been forfeited desire to apply for another such permit, the same fee shall be required, but the required bond shall be in the sum of $300.00. After a second forfeiture, the required bond shall be $500.00.

periodic cycle peak for total coliform. This suggests that there is an association between total coliform concentration and the period of high annual discharge, sometimes referred to as the annual flood. It has been reported that coliforms can survive in soil and bed sediments for an extended period of time, sometimes several months (Sherer et al., 1992; USEPA, 2001). It is possible that during the annual high flow event, the coliforms

ran, 1994; Malamud and Turcotte, 1999). Short-term persistence implies that the effect of an observation becomes negligible after a short period of time. Long-term persistence implies that the effect of an observation on future observations remains significant after a long period of time. Thus, short-term and long-term persistence

Conclusions

Time and frequency domain analyses of total coliform concentration time series data have been performed to investigate the temporal variation and persistence of total coliform in a stream. It was found that total coliform concentrations were higher in summer months and lower in winter months, as expected. Time domain analyses were performed using an autoregressive moving average model, whereas the frequency domain analyses were performed using spectral analysis. The time domain analyses indicate short-term persistence in the time series (4 to 15 wk) whereas frequency domain analysis showed short-term (15 wk) as well as long-term (55 wk) persistence. It appears that precipitation is the likely cause for short-term persistence, where long-term persistence is controlled by discharge (baseflow). Although the analysis indicates both short-term as well as long-term persistence, the study results could not distinguish which is more significant based on the present data set. By understanding which hydrological processes, as identified in this study, influence total coliform concentrations, improved watershed management strategies may be developed.

From BurkeCreek_WQ_UN_ ReportDogsWaterQuality.pd:

THE RESULTS

E. coli in Wastes and Water Content: Dog wastes were an average of 47% water and a gram (slightly less than 0.04 ounces) of fresh feces contained an average of 50 million CFU/gram with a range of 2 million to 200 million CFU/g. The wide range can be attributed to the highly variable nature of dog food, digestive health and diets.

Waste Accumulations: Dog wastes were distributed very unevenly throughout the study site. Most wastes accumulated in areas that were either very close to trail heads or where trails crossed (Figure 2). This is likely because of canine territory marking behaviour and preference for certain kinds of toilet areas. Overall, approximately 100 pounds of wastes, as dry matter, accumulated in the study area over the course of 14 months. The accumulations differed by season, with much less in winter months than in other seasons. This was likely because the site was covered with snow and inaccessible.

Link Between Water Samples and Waste Accumulations: Sampling did not show extensive water contamination or a link between accumulated dog wastes and *E. coli* in Burke Creek (Figure 3). In fact, we found that in general water leaving the study area had fewer CFU/100 ml than water entering the study area. This may have been due to a wetland through which the creek meandered and a small pond in the stream course that was designed to trap sediment. Although numbers of *E. coli* CFU/100 ml were occasionally high, no single sample from water leaving the study area exceeded federal guidelines set to prevent illness from contact with water (a geometric average of 126 CFU/100 ml).

E. coli Survival in Dog Waste: We found nearly complete loss of *E. coli* in dog feces within 60 hrs of exposure to evaporation rates of 0.08 inches/day and within 15 hrs for 0.30 inches/day. Although temperature had a small effect on the rate of *E. coli* die-off, water content had the biggest effect on how quickly *E. coli* disappeared from feces.

WHAT THE RESULTS MEAN

The results suggest that under the right circumstances E. coli in dog wastes may die quickly as moisture evaporates from feces, with complete die-off even before feces are completely desiccated. This helps to explain why we found no link between *E. coli* in water samples and the accumulations of dog wastes in the study area drained by Burke Creek.

In order for water to be contaminated, bacteria must enter the water. This can happen in a variety of ways, including direct introduction (by feces on bicycle tires or shoes), or indirect introduction by water or wind. It is possible that wastes in the study area were concentrated in areas where wind and water could move feces into Burke Creek. With regards to water, soils at the site were sandy and, unless frozen, very unlikely to have water running off them. In this case, areas where large amounts of feces accumulated may have exposed feces to high evaporation rates, which could quickly kill *E. coli* under the right circumstances.

The studies have several limitations that are important to understand. First, the survival studies took place under carefully controlled conditions in a laboratory. This was necessary to be sure that death of *E. coli* could be linked with evaporation rates. Second, the samples used in the study were smaller than an average dog feces. This means that the effects of evaporation on *E. coli* survival were likely to have been exaggerated. Third, the experiments considered only one strain of *E. coli*. Although *E. coli* is considered an indicator of contamination with feces, it is not clear that it is like all disease-causing microorganisms. In fact, some microorganisms such as *Cryptosporidium* and *Giardia* survive environmental

From Boulder, Colorado website https://www.keepitcleanpartnership.org/pollution-prevention/scoop-the-poop/ :

The Facts

Dog waste is cited as the 3rd or 4th largest contributor of bacterial pollution in urban watersheds.

The average dog produces approximately 3/4 pounds of poop every day. 1,000 dogs will produce 750 pounds of excrement a week. There are approximately 30,000 dogs in the city of Boulder alone. That's a lot of poop! Do your part- pick up after your dog. It's the neighborly thing to do!

Dog feces have higher phosphorous concentrations than found in cow and swine manure. Phosphorus is a nutrient that negatively impacts water quality and plant species. Nitrogen, found in dog urine, also causes contaminated runoff and leads to serious water quality issues.

"Keep it clean, 'cause we're all downstream!"

From Municipal World website https://www.municipalworld.com/feature-story/dog-waste-dilemma/

Examining the problem and determining the solution

Over the last decade, dog populations have been growing, especially in urban areas. As a result, dog waste has become a huge problem for municipalities, landfills, and park users. Exacerbating the problem is a common misconception that dog waste is “natural” – and therefore not harmful to the environment. But, the composition of dog waste is much different than that of other animals.

HEALTH RISKS AND ENVIRONMENTAL IMPACTS

Due to dogs’ stomach enzymes and diets, their waste is different from that of wild animals, containing incredibly high concentrations of nitrogen and phosphorus. This waste is also packed with very high levels of bacteria (such as E. coli, viruses, and parasites) that linger in the soil for years. As a result, dog waste pollutes watersheds, poses health risks to humans, spreads diseases and parasites to other dogs, and presents several other problems for municipalities. In small numbers, these threats would be minimal; but, we are not talking about small numbers. On average, one dog produces approximately one kilogram of waste every three days; and, according to the Canadian Animal Health Institute, the dog population in Canada is approximately 7.6 million dogs (as of 2016). Nationally, that translates to over 2.5 million kilograms of dog waste per day, and over 924 million kilograms per year. With that amount of waste, it’s no wonder that dog waste is considered a leading cause of pollution in urban watersheds. Studies have shown that as much as 30 percent of all bacteria in urban watersheds can be traced back to dog waste.

Beyond the health risks and watershed contamination, dog waste presents several problems for municipalities, including overuse of landfills, contamination of recycling bins, and ballooning labour costs in parks. Hundreds of millions of kilograms of dog waste is finding its way into the garbage bins of municipal parks. In fact, municipal park waste audits in different cities report that between 40 and 80 percent of waste in park garbage containers is dog waste. Worse yet, some cities report that as much as 97 percent of their recycling containers are contaminated by pet waste, with all of that potentially recyclable material then destined for the landfill.

Segregating and diverting dog waste to anaerobic bio-digesters is a way to turn that waste into a resource. When dog waste is processed through an anaerobic bio-digester, it creates biogas, which is used to generate power. The City of Waterloo has already begun doing this and has seen great success so far. The idea seems to be catching on, too, as anaerobic digestion facilities are being built in several places across Canada, including the City of Edmonton (which is scheduled to open a brand new, state of the art facility in 2018).

MEETING THE CHALLENGES

While dog waste is clearly a large and challenging problem across the country, a little planning now can lead to some big benefits down the road.

The first challenge involved is keeping dog waste off the ground. Some people forget to bring bags, others don't bring enough bags, and some simply aren't aware of how dog waste harms the environment. Combined with public awareness campaigns, pick-up bag dispenser programs have been tremendously successful in increasing pick-up compliance. By having bags available in public dispensers, dog owners no longer have an excuse; and, when combined with public education, such initiatives can encourage a culture of responsible ownership throughout the community.

For example, Winnipeg's Kilcona Dog Park Club conducted a year-long trial program to evaluate the effectiveness of pick-up bag dispensers. The study "concluded that the bag dispensers were responsible for a demonstrated improvement in park cleanliness, and that the bag dispensers were well worth the cost and effort to maintain them." This success is commonplace across Canada. (Practica Ltd. has been a supplier of pick-up bag dispensers and bags since 2000, and now serves over 400 municipalities from Halifax to Yellowknife.) Corporate sponsorship and licence fees can be a way to help cover the costs of bag dispenser programs, while local dog park groups can help with maintenance.

The second challenge is dealing with the waste after it's been picked up. In municipal parks, regular waste bins are often overflowing with dog waste, creating several problems, not the least of which is odour issues. Bins fill up very quickly, requiring staff to empty the heavy bins far more often than necessary; recycling containers end up getting contaminated; and all of the waste ends up bound for landfills that either don't want it or don't have room for it. To help address this issue, Practica Ltd. recently partnered with Sutera to distribute the in-ground dog waste containment system. The in-ground bin provides a specific place for park users to deposit their used pick-up bags. The top of the unit is specially designed so that other waste, such as coffee cups, will not fit in the chute. As a result, the large underground catch basin fills with dog waste, which can then be emptied by a vacuum or vertical lift truck, and be hauled to a facility capable of properly dealing with the waste.