April 23, 2015

TO: Denver Water Staff
FROM: INC Parks and Recreation Committee (PARC)
Dear Denver Water staff,

We are among the people who have begun to notice an unusually high rate of decline and removal of mature trees--especially conifers--over the past few years in the Denver Parks that are being irrigated with recycled water. To better gauge the extent of the problem, we conducted a brief survey of the mature pine, fir, Douglas fir and spruce trees in Washington Park, which has been irrigated for ten years with recycled water, and Cheesman Park, which only began irrigation with recycled water last year. We compared the number of conifers present in the parks today against a tree inventory from 2004 for Washington Park and an inventory from 2005 for Cheesman Park. Obviously we excluded any trees planted since the initial inventories were made, and we also excluded trees that had to be removed for reasons of trail and walkway construction, irrigation ditch rebuilding, playground and picnic area improvements, and other deliberate human causes.

What we found is that over the most recent eleven year period, 134 of the 405 mature conifers in Washington Park died or declined to the point of having to be removed, a loss rate of 33%. In contrast, over the most recent ten year period only 41 of the 550 mature conifers in Cheesman Park have been lost, a rate of 7.5%. Since many environmental factors (amount of irrigation water applied, type and rate of fertilizer application, occurrence of pests and plant diseases, mix of coniferous tree species, late and early freezes, droughts, number of very hot summer days, heavy snow loads, rate of trunk damage from mowing operations, the timing of the original planting, etc.) apply rather equally in both parks, we are left with relatively few factors to explain the differential tree mortality.

Past research by Denver Water indicated that impurities in recycled irrigation water--most notably high sodium levels--could have a deleterious effect on tree health. We have read the Denver Water summary publication "Recycled Water for Soil and Trees" in an original and an updated version. In order to better understand the parent studies that were summarized, we would like you to send us copies of the full reports referenced as follows:

1. "Recycled Water for Denver Landscapes" prepared by Aqua Engineering, September 2004.
2. "Soil Testing Five Years After Irrigation with Recycled Water" prepared by Colorado State University, July 2010.
3. "Evaluation of Trees Subjected to Reclaimed Water at Selected Locations" prepared by Day & Associates, July 2010.

We would also like to obtain copies of any other research reports that have been developed on the issue of recycled water's impact on landscape vegetation, including a study of landscape management recommendations by PRZ Sports Turf Consulting and THZ Associates and a study that was done of potable water flushing at a golf course.

Finally, we would like you to please answer the following questions:

1. Are you presently conducting or planning to conduct any research that could further identify high-sodium recycled irrigation water as a principal cause of woody plant decline in Denver parks? If so:

- What is the time frame for such work?
- Has the work been budgeted and for what amount?
- Will a selection of both deciduous and coniferous tree species be analyzed?
- Which tree species are being/will be investigated?
- What analytic methods will be employed?
- If a research design has been developed, may we see a copy?
- Who will be the principal study investigator(s)?

2. Are you conducting or planning to conduct any research to evaluate the efficacy of remediation measures to counteract the potentially harmful effects of high-sodium irrigation water on woody plant health in Denver parks? If so:

- Which remediation measures will be evaluated?
- How long will research take to yield results?
- Which tree species will be evaluated?
- Has research been budgeted and for what amount?
- If a research design has been developed, may we see a copy?
- Who will be the principal study investigator(s)?

3. Are you conducting or planning to conduct any research to evaluate the potential long-term harm high-sodium recycled irrigation water may cause to soils in the parks, specifically whether the soils will be able to continue supporting healthy woody plants in the future? If so, we would like to know the details of such research.

4. Is any contingency planning being done to develop proposals for further reducing the amount of sodium in the recycled water being used for park irrigation, in the event that research shows the water at the current level of purification is causing irreparable harm to park trees and soils?

5. What is the long-range plan for adding Denver parkland to the recycled water irrigation system? Does this plan entail the expansion of the existing treatment plant to furnish recycled water? We would like to read any documents related to Denver Water's plans for the recycled water system and its staging.

Best,

Katie Fisher

Katie Fisher

Maggie Price, co-chairs

Maggie Price

INC Parks and Recreation Committee

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