

A case study for water reuse in nursery production

by Shital Poudyal, Kelly Kopp, Josh Zimmerman, and Katie Wagner

Introduction to the study setup

In 2023, we conducted a grower-based research trial at Progressive Plants, a commercial nursery in Copperton, UT 84006. The study setup (Fig 1) was completed on July 20, 2024, and treatment began on August 1, 2024. The study aimed to evaluate the effects of reused water on plant growth and visual quality by comparing plants grown using municipal water with those grown using reused runoff water containing agrochemical residues. To generate runoff water, we constructed a runoff bed that was approximately 1.6 meters in diameter and approximately 1.2 meters in depth. The runoff bed was maintained as a simulation of a commercial nursery production. Our grower treated the nursery bed as he would treat his other production sites by applying the same fertilizer and pesticides that he applied to his other production sites.

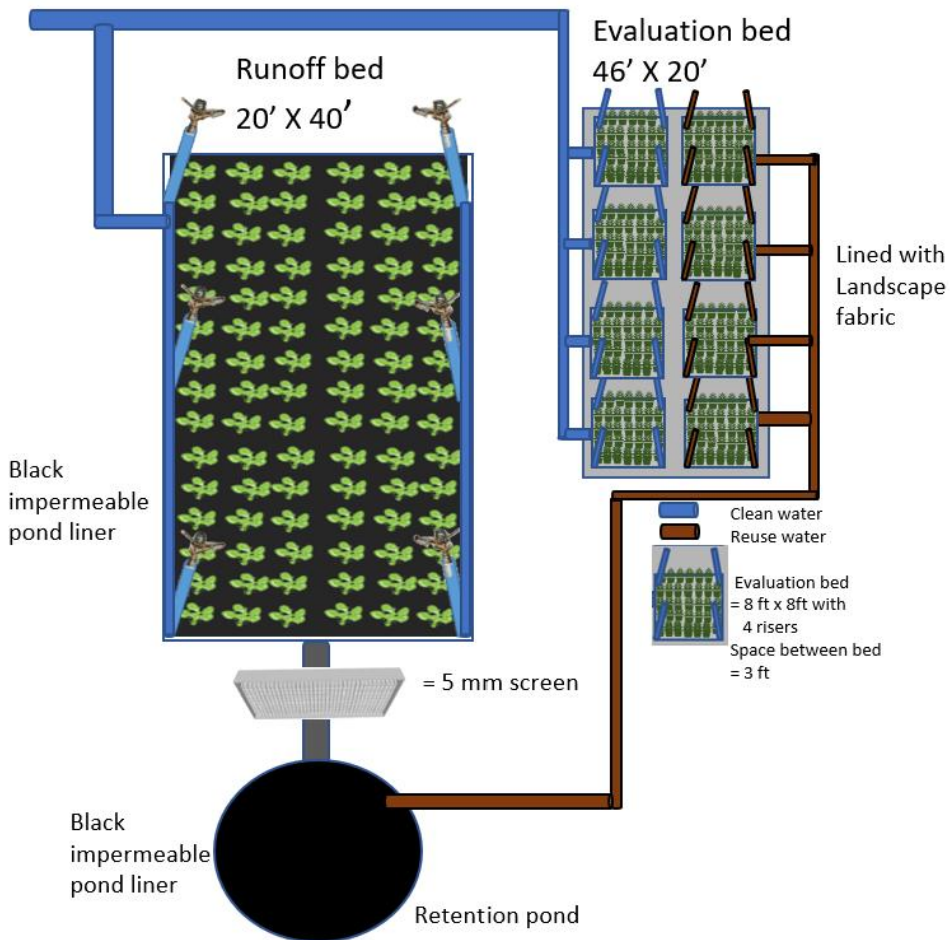


Figure 1: Sketch of the study site (not to scale).



Figure 2: Real image of the study site

Runoff bed

The runoff bed contained 400 two-gallon plants of *Cornus alba* 'Bailhalo' Ivory Halo[®], and was irrigated every day for 20 minutes using an overhead impact spray head. The plants in the runoff bed received 30 grams of slow-release fertilizer (15:9:12, Osmocote Plus) at the start of the study and also received the following pesticide applications:

- **August 4:** Primera One was applied as a drench at a rate of 0.95 ml per liter (1.2 oz per 100 gallons). The active ingredient of Primera One is Imidacloprid. It is a systemic insecticide that targets sucking insects by interfering with their nervous system.
- **August 7:** Daconil Ultrex fungicide was applied as a spray at a rate of 1.68 g per liter (1.4 lbs per 100 gallons). The active ingredient for Daconil, Chlorothalonil, is a broad-spectrum fungicide that prevents fungal spores from germinating, protecting plants from diseases.
- **August 31:** First Dipel was spray applied at a rate of 0.6 ml per liter (8 oz per 100 gallons), followed by spray application of Pageant at the rate of 0.6 ml per liter (8 oz per 100 gallons). Dipel contains *Bacillus thuringiensis* (Bt), a biological insecticide effective against caterpillars, while Pageant contains Pyraclostrobin and Boscalid, which work together to control fungal infections.

Runoff water (irrigation return flow) from the runoff bed was collected in a retention pond and used to irrigate half of the plants in the evaluation bed.

Evaluation bed

The evaluation bed consisted of 8 blocks, each measuring 2.4 x 2.4 meters. Every four blocks received either municipal water or reused water. Reused water was sourced from water collected in the retention pond and pumped to irrigate plants as overhead irrigation. This setup allowed for the assessment of any potential impact that reused water might have on plant growth and visual quality. The plant species included in the evaluation bed were *Cornus alba* 'Bailhalo' Ivory Halo[®] (dogwood), *Spiraea japonica* 'DOUBLE PLAY' Doozie[®] (spirea) and *Hydrangea paniculata* 'Bailpanone' Little Hottie[®] (hydrangea). Each block contained four replications of these plants, and they received the designated treatment water for two months.

Results

At the end of the study, plants were evaluated for growth index and visual rating. The results indicated no significant differences between treatments, except for Hydrangea, which showed a higher visual index when irrigated with reused water compared to municipal water. This suggests that reused water will not have any adverse effects when irrigating container plants, i.e., dogwood, hydrangea and spirea.

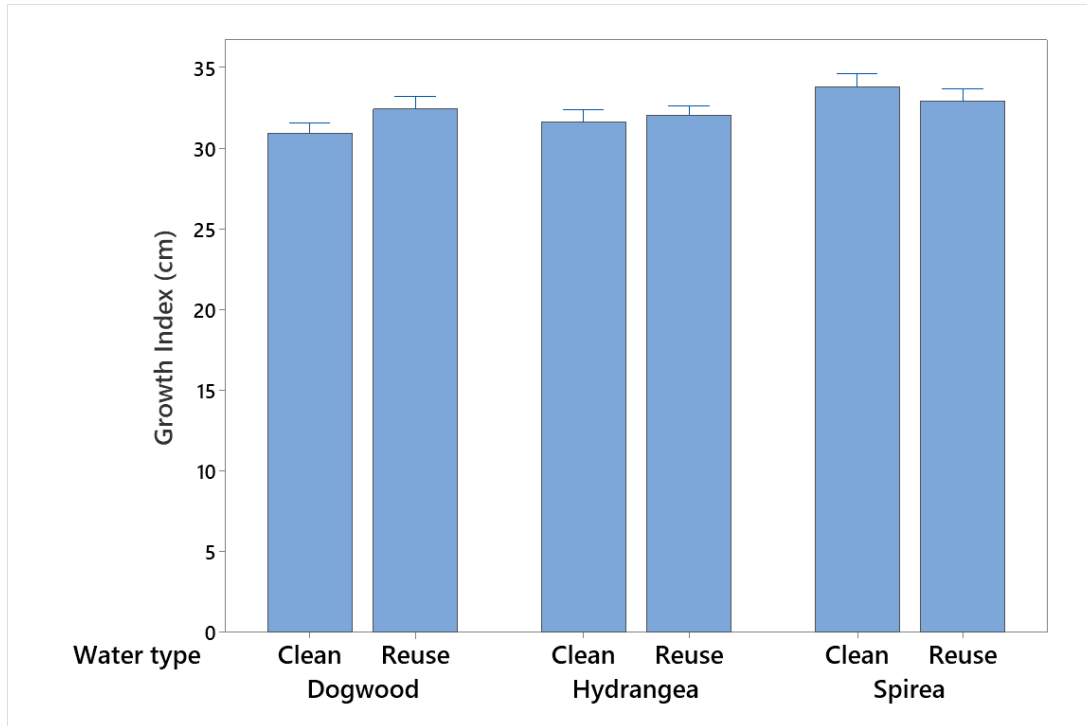


Figure 3: Comparison of growth index, which is calculated as the average of height and two perpendicular widths of the plant, between clean and reused water for three different plant taxa. There was no significant difference between the values for clean and reused water on any of these taxa at $p < 0.05$.

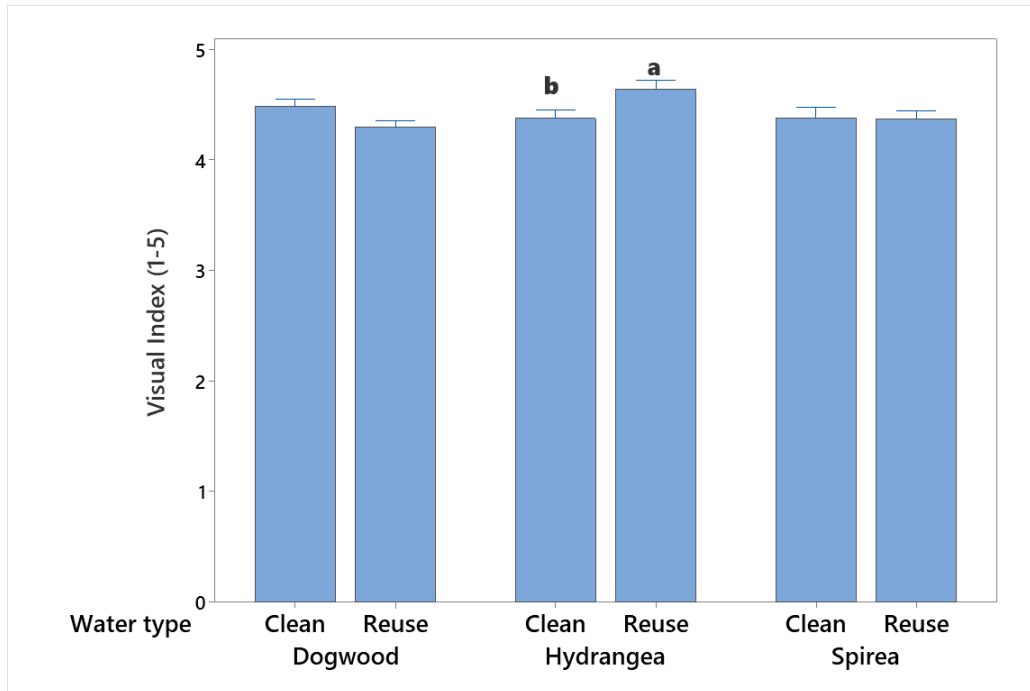


Figure 4: Comparison of visual quality on the range of 0 to 5, where 0 is a dead plant, and 5 is a perfect plant, between clean and reused water for three different plant taxa. There was no significant difference between the values for clean and reused water on dogwood and spirea at $p < 0.05$, however, for hydrangea, reused water had better visual quality compared to clean water.

Conclusion

The study demonstrated that the use of reused water in irrigation did not negatively impact plant growth or the visual quality of container-grown plants. The exception was hydrangea, which exhibited an improved visual index with reused water. These findings suggest that runoff water can be a viable irrigation source without compromising plant health and aesthetics. This research was conducted at the growers' site and by the growers with minimal data collection, hence serves as a case study rather than robust research. Further research may be needed to assess the long-term effects of reused water on plant performance.