

To: Long-Term Water Augmentation Committee, Governor's Water Augmentation, Innovation & Conservation Council

From: Sarah Porter

Date: August 18, 2020

Re: Summary of Research on Management of Invasive or Encroaching Plant Species as a Water Augmentation Strategy

1. Is there research that demonstrates the impact of the strategy on stream flows or groundwater supplies? Can those impacts be generalized to larger geographies (e.g., basin-wide or statewide)?

There is research indicating that removal of encroaching or invasive plant species can result in greater stream flows or groundwater supplies. The water impacts must be assessed on a site-by-site basis and cannot be generalized to larger geographies because of the complexity of hydrologic processes and diverse characteristics of both vegetation and stream systems.

Factors to consider:

- **Long-term Costs:** Invasive and encroaching species tend to be hardy and persistent. Typically, their removal or control requires a long-term effort as well as strategies for replacement vegetation.
- **Replacement Vegetation:** To achieve water benefits (that is, elevated water table or increased stream flows) replacement vegetation must consume less water than the vegetation removed.
- **Negative Hydrologic Impacts:** Reducing plant cover can decrease water infiltration into the soil, destabilize stream banks and result in lower availability of forage plants. It can also increase soil evaporation, sedimentation and dust.

2. Would the strategy result in reliable, long term additional water?

In some places, reducing invasive or encroaching plant species may result in additional water supplies as well as other benefits, such as better soil conditions, reduced fire risk and improved habitat. Whether those water supplies would be reliable or available long-term depends on long-term vegetation management, precipitation and other factors.

The assessment whether vegetation control will yield water augmentation benefits must be made on a site-by-site basis and requires input from various disciplines, including hydrology and rangeland ecology.

3. Are there opportunities/constraints to this strategy that the committee should consider?

- For each proposed plant species management project, a cost-benefit analysis should be conducted, comparing the potential water yield with the costs of long-term vegetation management.
- Existing funding opportunities tend to discourage the inter-disciplinary collaborations that are needed to advance research on vegetation management for water supply and habitat improvement.
- Investments in plant management probably make the most sense in places where there are benefits in addition to water salvage – for example, soil or habitat improvement or fire risk reduction.

4. Is the research conclusive enough or does it require more focused research or pilot projects?

More focused research and pilot projects are needed – specifically, pilot projects in which inter-disciplinary teams of experts work together to identify project sites where there is potential for water augmentation along with other benefits, design and implement vegetation management strategies and assess the outcomes over a term of five or more years.

From those pilot projects, a set of technical tools should be developed for broader use throughout the state.

Selected Bibliography for Phreatophyte Management as a Water Savings Strategyⁱ

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1. [This article reviewed different studies associated with recharge estimation methods, mechanisms by which woody plants impact groundwater recharge, effects of woody plant on recharge across different soil and geology, hydrological repercussions of woody plant removal.] https://www.researchgate.net/publication/328335937_Woody_Plant_Encroachment_Impacts_on_Groundwater_Recharge_A_Review
2. [This article provides a framework for conceptualizing how woody plant encroachment is likely to affect components of the water cycle within these ecosystems.] <https://esajournals.onlinelibrary.wiley.com/doi/10.1890/03-0583>
3. [This post discusses the reasons why mesquite trees are replacing grasslands by providing findings from relevant research.] <https://uanews.arizona.edu/story/mesquite-trees-displacing-southwestern-grasslands>
4. [In this assessment, the parties of Memorandum of Understanding (MOU) investigates potential water augmentation alternatives that might provide future water supplies within the Colorado River Basin.] https://riversedgewest.org/sites/default/files/files/TRO_Assessment_FINAL%2012-09.pdf

ⁱ Bibliography prepared by Cyndi Ruehl, ADWR.