# Where has all the nitrogen gone? Investigating soil nutrients during the transition from lawn to xeric landscapes Heavenrich, Hannah R.<sup>1</sup>, S.J. Hall<sup>1</sup>, J. Rittenhouse<sup>1</sup>, & C. Holmes<sup>1</sup>. <sup>1</sup>School of Life Sciences, Arizona State University, PO Box 874501, Tempe, AZ 85287-4501

### What are the biogeochemical outcomes of converting a residential landscape from a grassy lawn to an alternative xeric landscape? In this research, I explore soil properties and the fate of soil nutrients in residential yards along a chronosequence of time-since-lawn-conversion.

### Background

- In the metro Phoenix area and all over the US West, homeowners are converting their water-intensive lawns to yards composed of rock or mulch groundcover and drought-tolerant shrubs (xeric landscapes).
- Conversion of lawn to xeric yards reduces water and fertilizer use and thus is promoted as a sustainable choice for water conservation.
- Replacement of turfgrass with shrubs likely limits plant uptake of soil water and nitrogen (N), which may lead to rapid microbial production of soil nitrate from less mobile N compounds. If not retained by plant roots or microorganisms, nitrate can leach from soil, potentially leading to water pollution.

## Study Sites & Methods



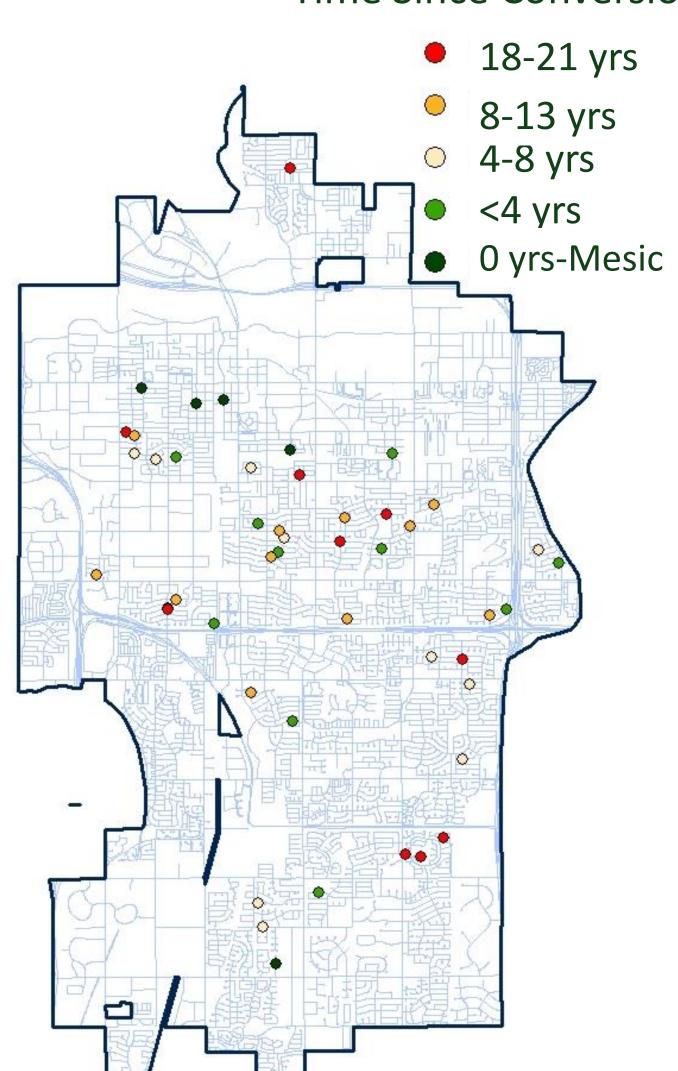


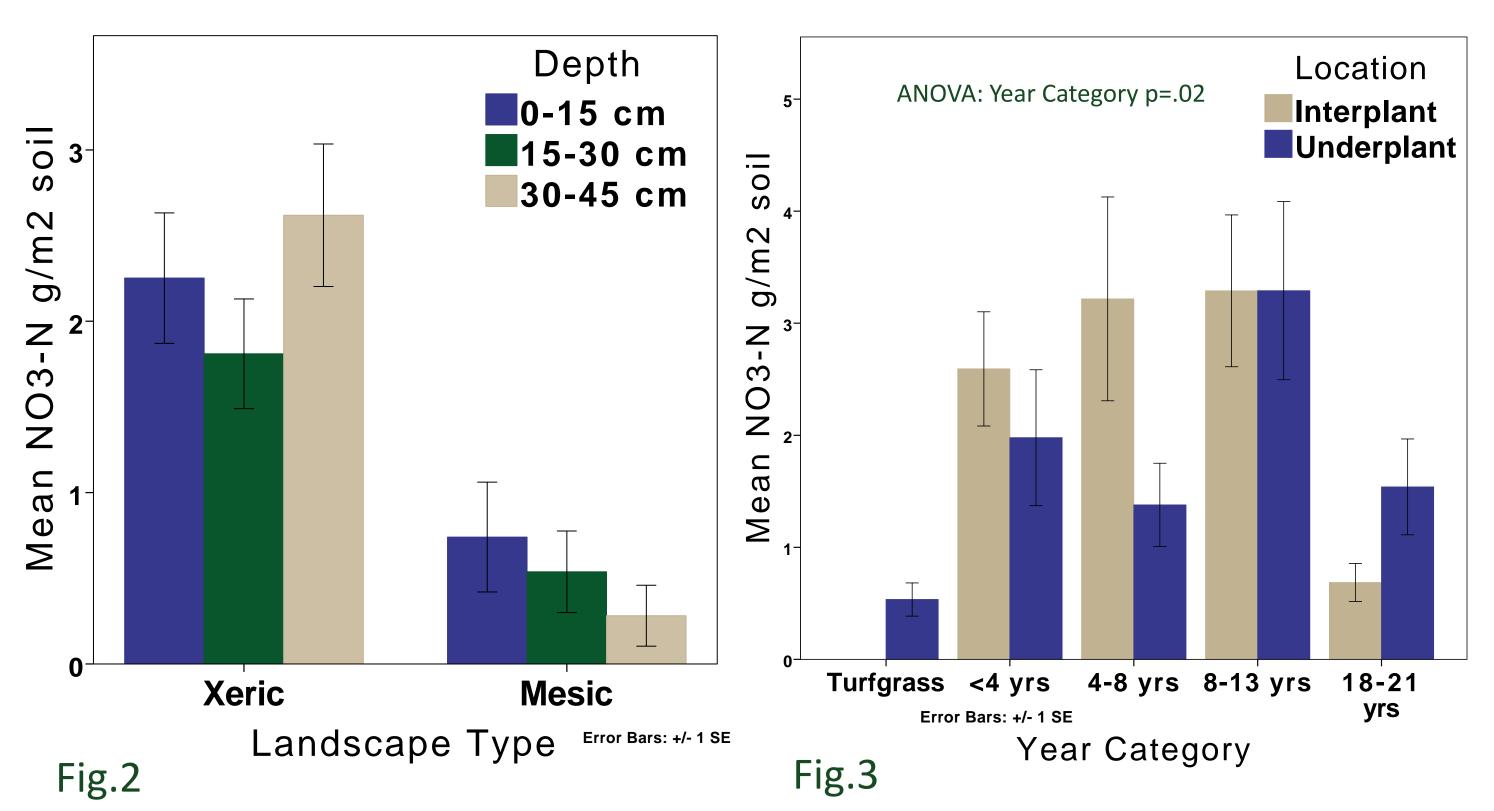
Fig 1. Map of study sites in the City of Tempe

- We used a stratified random sampling approach to select 40 houses from the population of houses who used the Tempe Rebate Program when they converted their yard.
- The houses were stratified by year of conversion. 5 mesic sites were selected via convenience sampling.
- All sites had soil cores taken in the interplant space and under shrubs at depths 0-15, 15-30, and 30-45cm. Cores were analyzed for soil nutrients and properties. • Vegetation and ground cover data was also collected using site surveys.

### Time Since Conversion

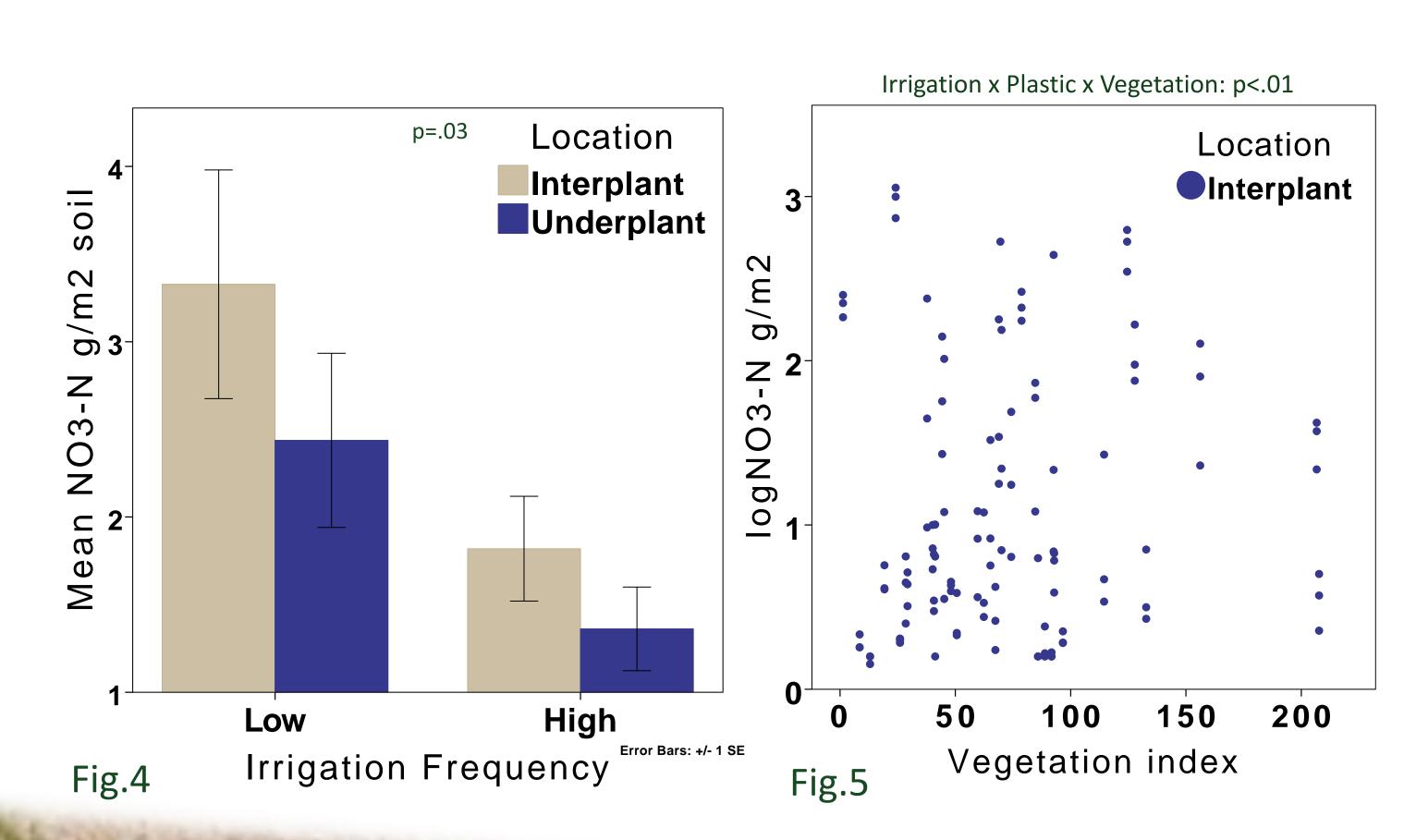
### Results

Xeric yard nitrate is generally higher than mesic yards. This relationship varies at certain times since conversion. Soil nitrate samples taken under plants or in-between plants differ significantly over time.



### Irrigation has a strong influence on nutrient levels in xeric

yards. Irrigating frequently may be causing increased plant uptake of nutrients or increased leaching from the upper soil column. There is a no direct correlation between vegetation cover and soil nitrate levels.



I predict that xeric yards will contain larger nitrate pools than turfgrass yards and that soil nutrient content will decrease with xeric site age (time since conversion).

### **Older xeric yards have smaller N pools than recently** converted yards when there is no plastic sheeting. When

plastic is present, the inverse is observed, the older the xeric yard, the greater the N pool. Data analyzed using a mixed model regression analysis with house as a random factor.

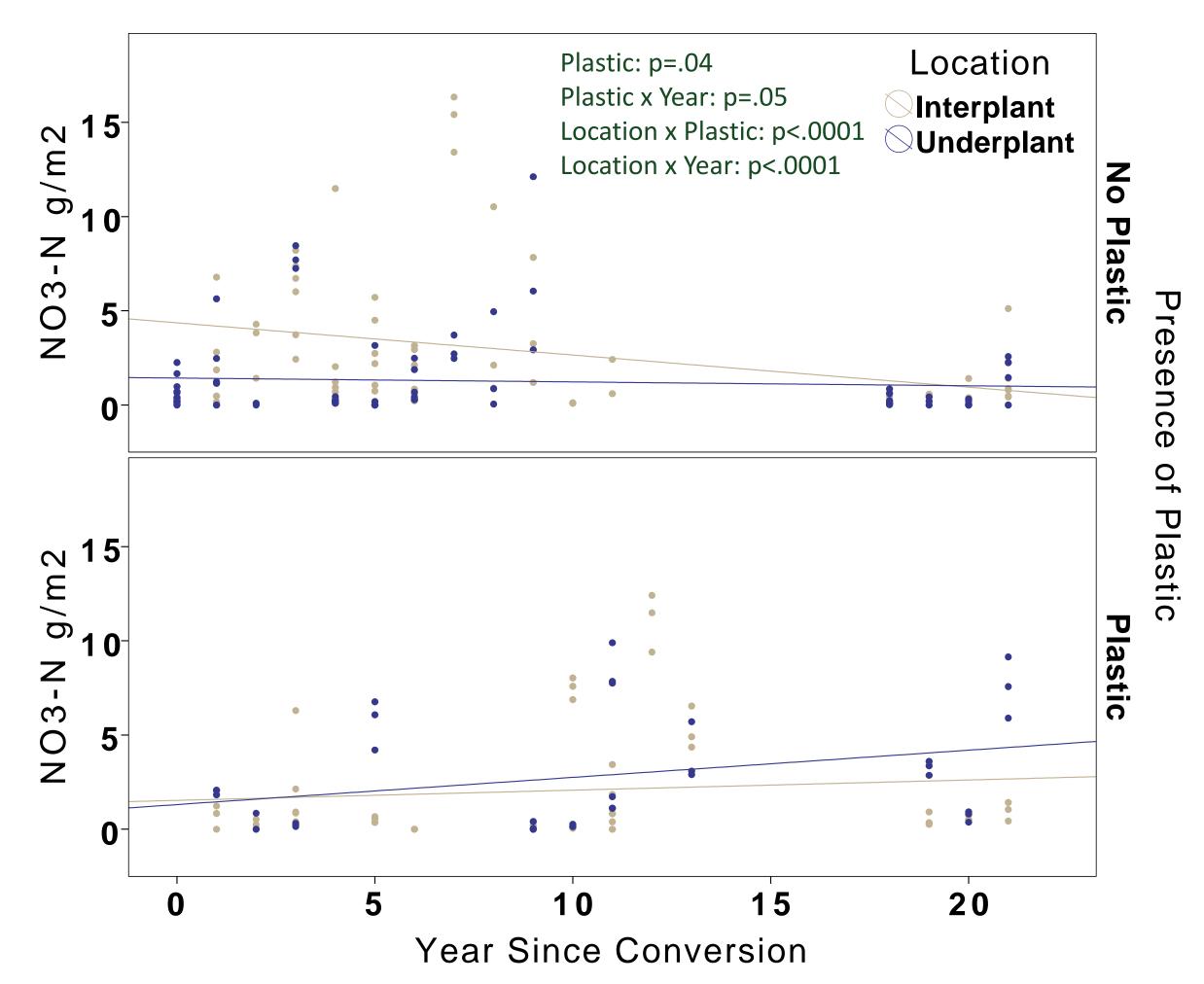


Fig.6

# Future Questions & Next Steps

- and N pool data.

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**Do sandy soils cause increased loss of N?** Assessing texture data and how it influences N cycling in xeric yards. How does precipitation affect nitrate availability? Looking at data collected over 2 rainy seasons using buried ion-exchange

resin bags and comparing it to precipitation data.

How does the conversion process affect xeric landscape

nutrients in the initial years after conversion? Using

responses to survey questions about landscape conversion

How can xeric landscape conversions and designs be optimized for lower nutrient loses in the future?