

# Where has all the nitrogen gone?

## Investigating soil nutrients during the transition from lawn to xeric landscapes

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**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.

**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).**

### 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.

**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.

### Study Sites & Methods

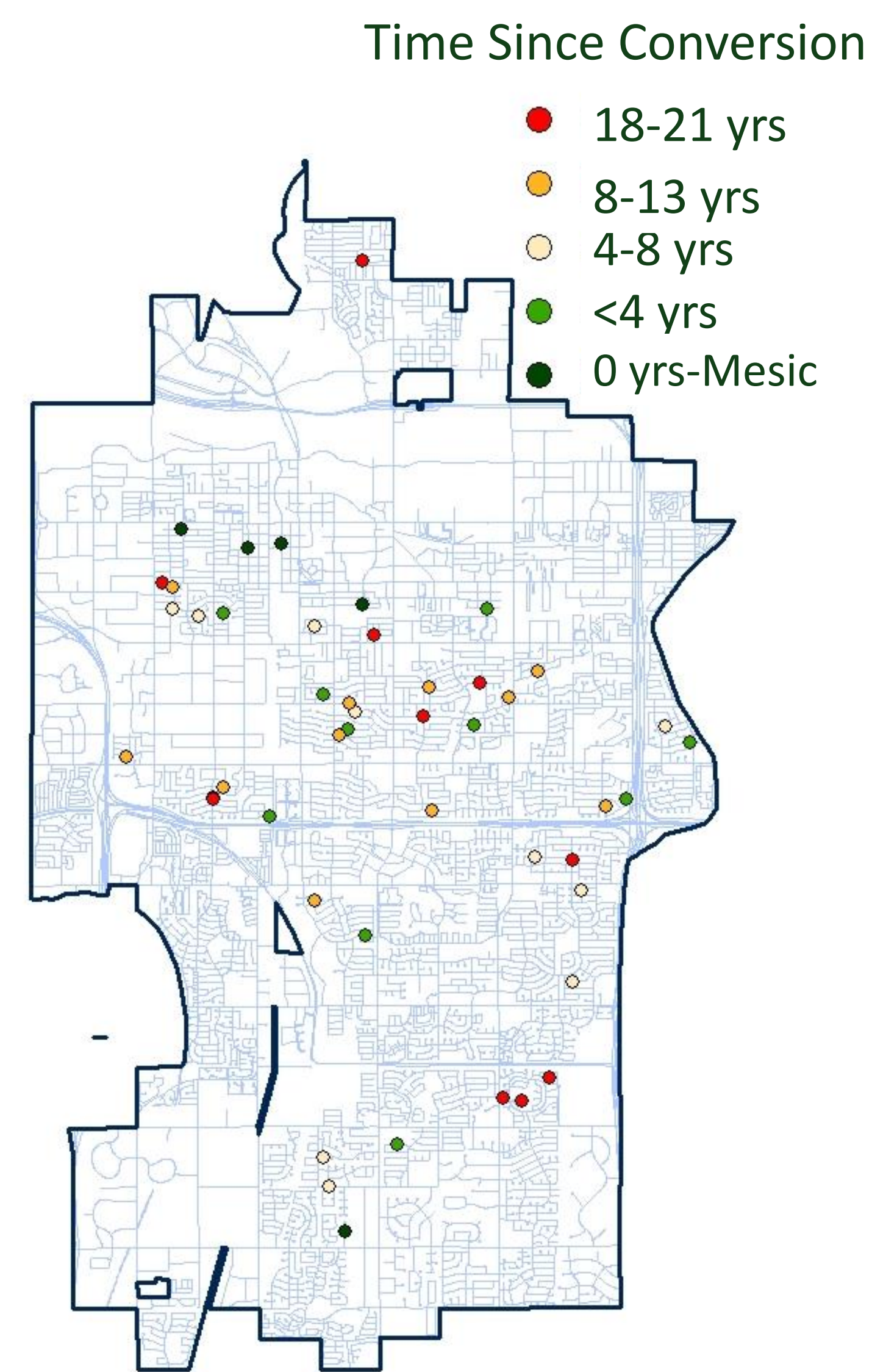
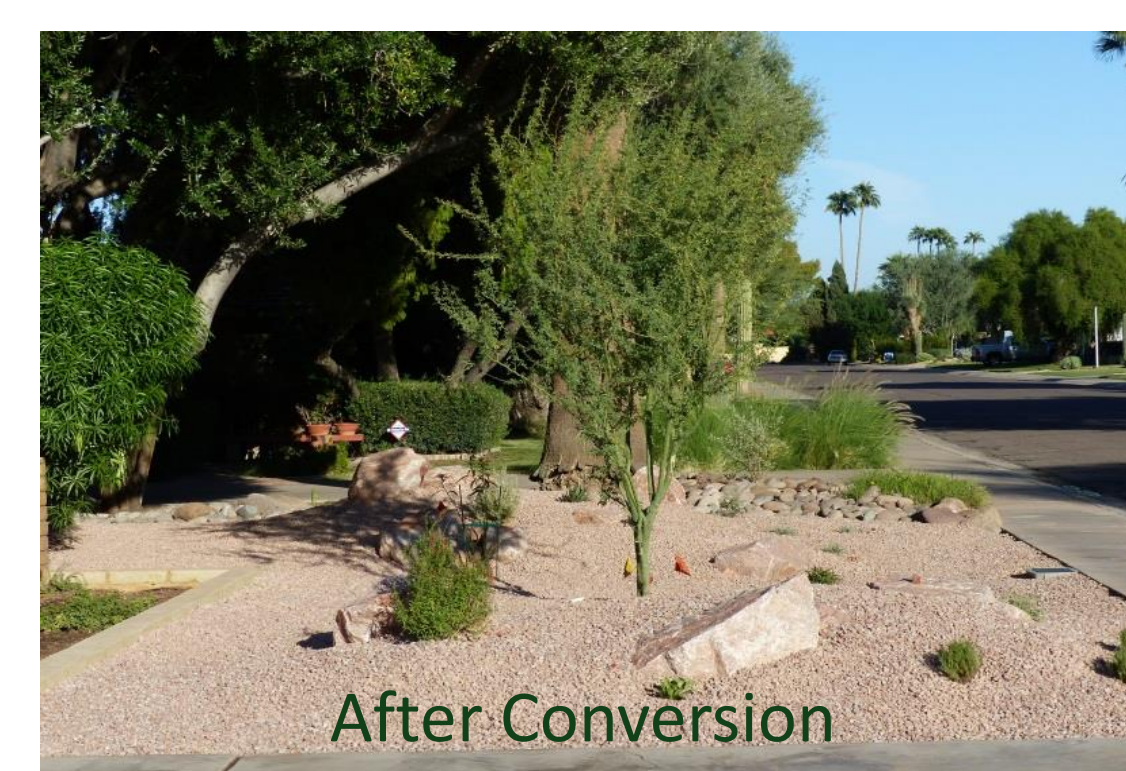
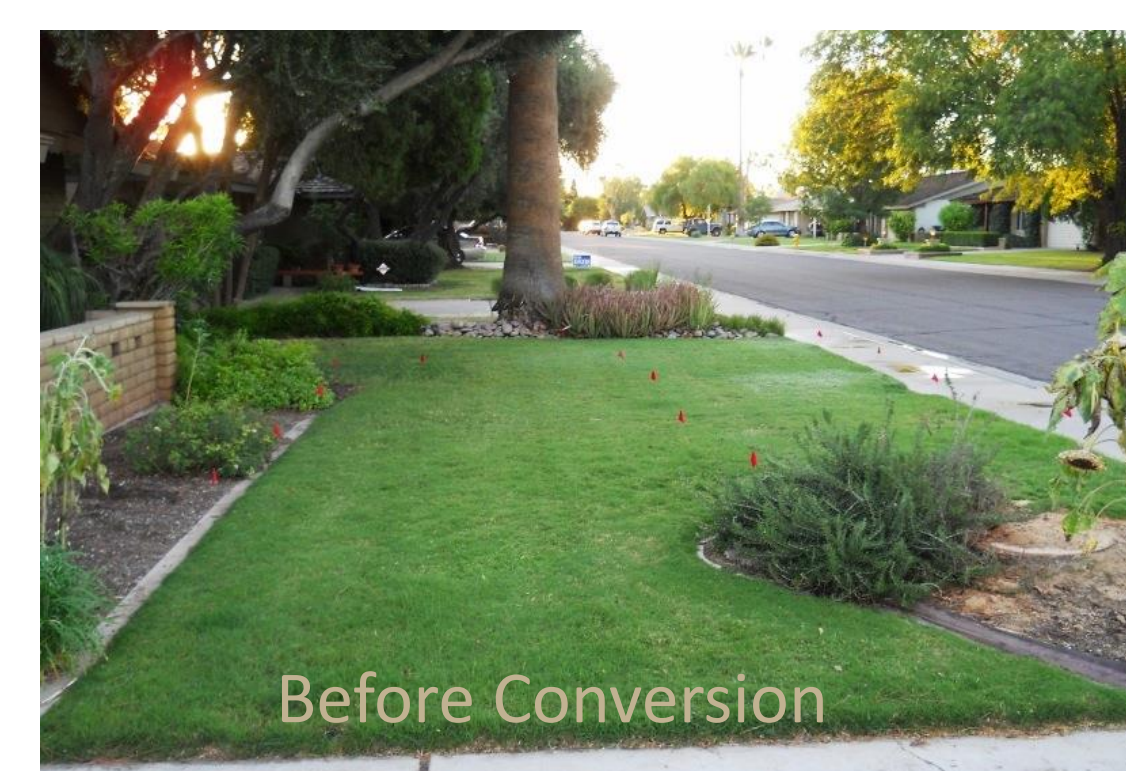


Fig 1. Map of study sites in the City of Tempe

- 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.

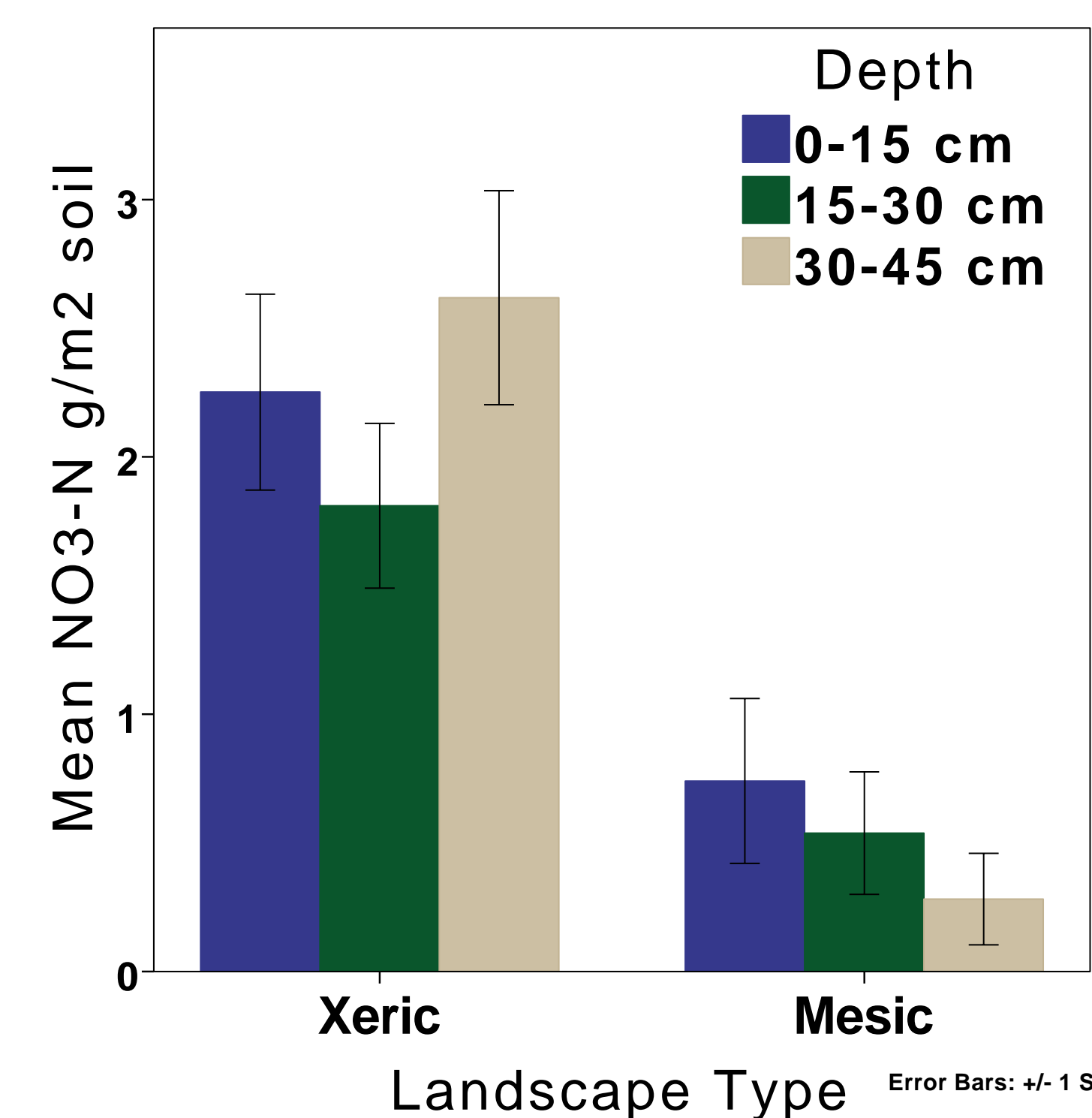


Fig.2

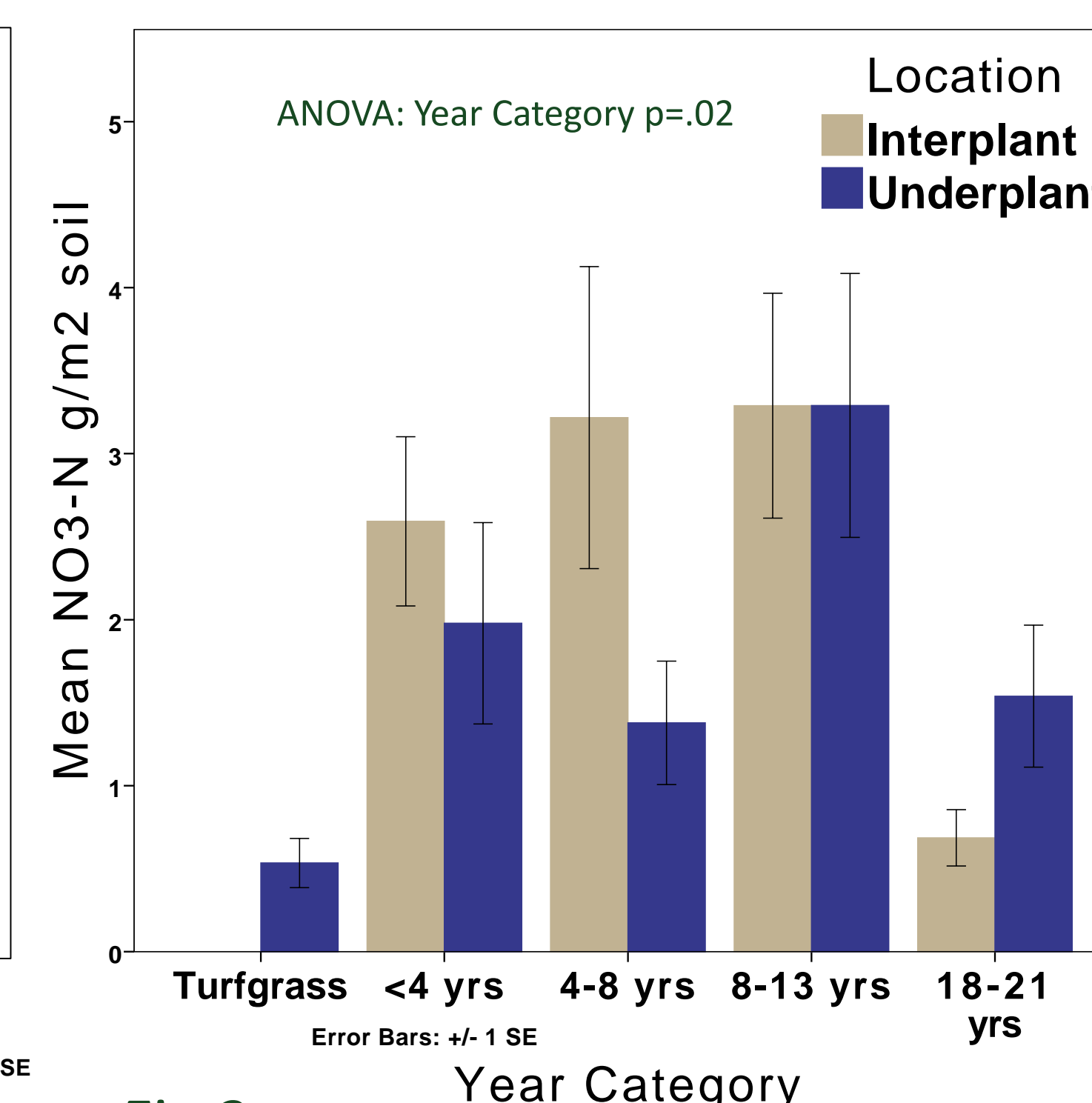


Fig.3

**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.

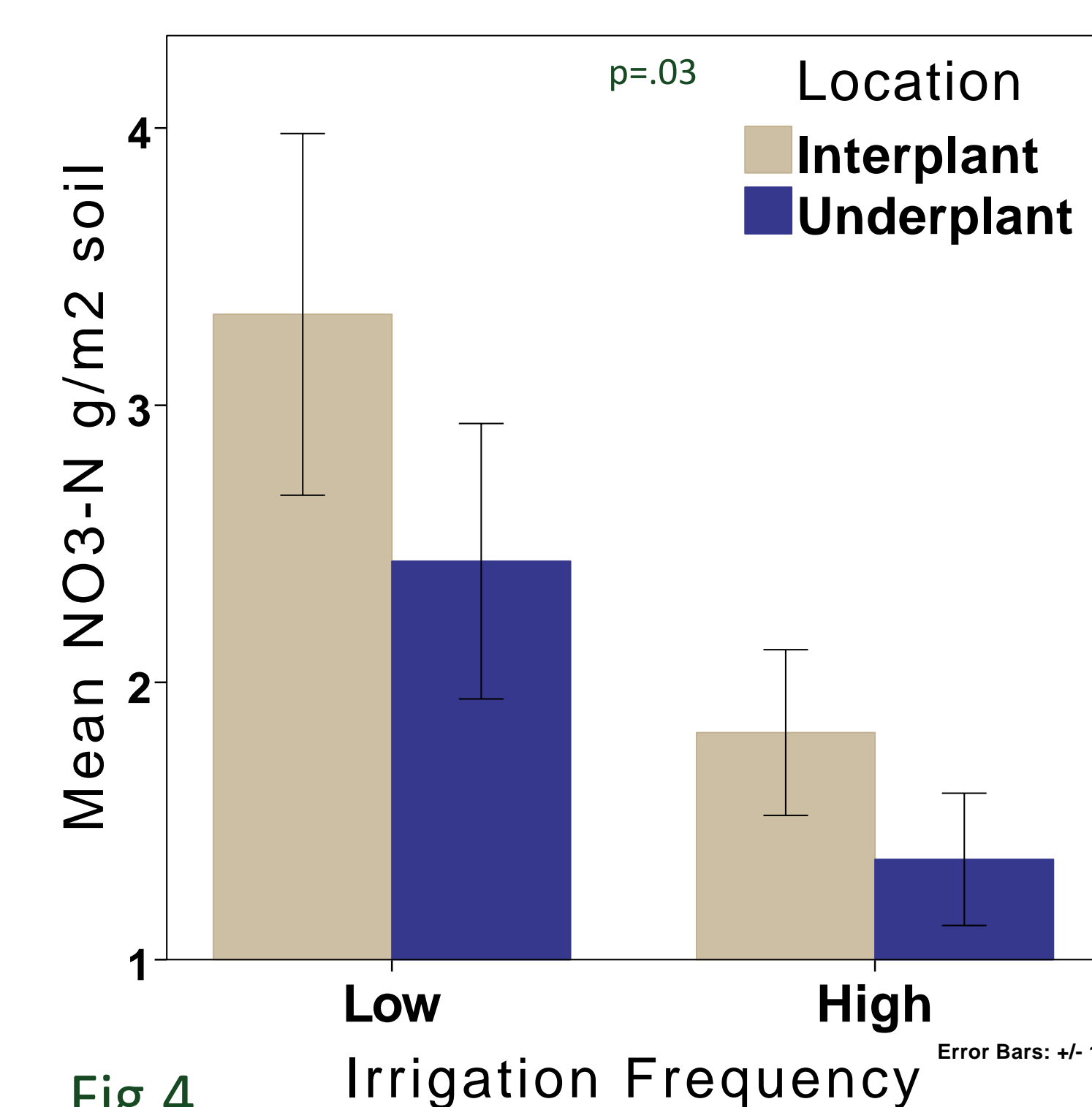


Fig.4

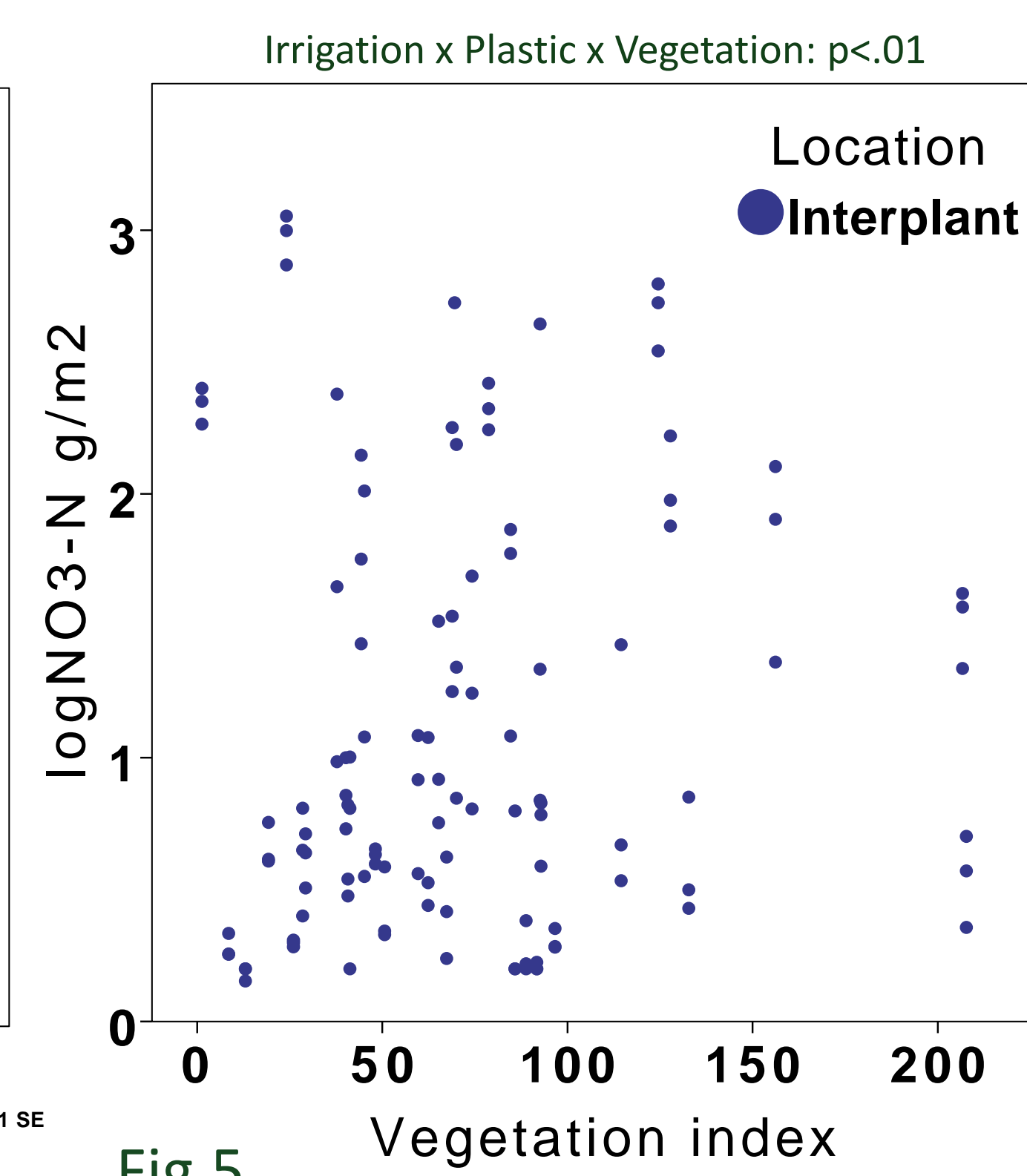


Fig.5

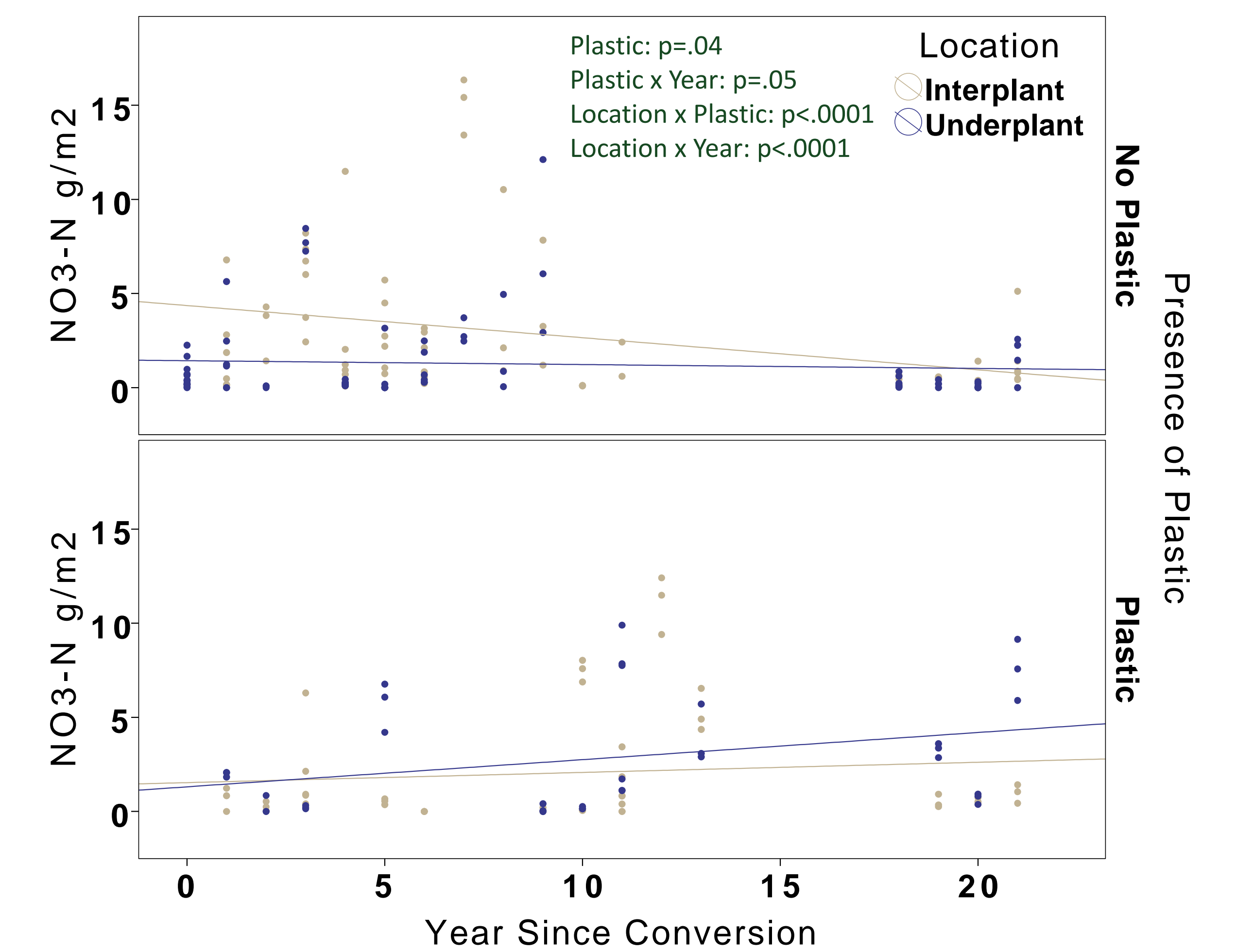


Fig.6

### Future Questions & Next Steps

- 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 and N pool data.
- How can xeric landscape conversions and designs be optimized for lower nutrient losses in the future?**

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