Spiders as a gauge for change:
Linking spider density to riparian habitat structure

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Abstract

- Urbanization often compromises the diversity and abundance of native species living in watersheds (Rodrigues et al., 2015).
- Research has shown that riparian spiders are susceptible to land use change associated with urbanization (Sanchez-Ruiz et al., 2017; Fig. 1).
- We conducted a spider density survey in riparian habitats in and around Atlanta as a metric to assess the impact of urbanization on regional spider populations.
- We hypothesized that if overhanging vegetation was important web-building substrate for some taxa and vegetation provided cover for ground-dwelling species, then the highest density of spiders would be found in transects with vegetation hanging over the stream.
- Our results indicate that overhanging vegetation was related to higher densities of web-weaving species. Increasing amounts of overhanging vegetation was also related to increasing bank slope, suggesting there may be potentially important interactions between physical and biological characteristics of riparian areas that mediate spider population structure.

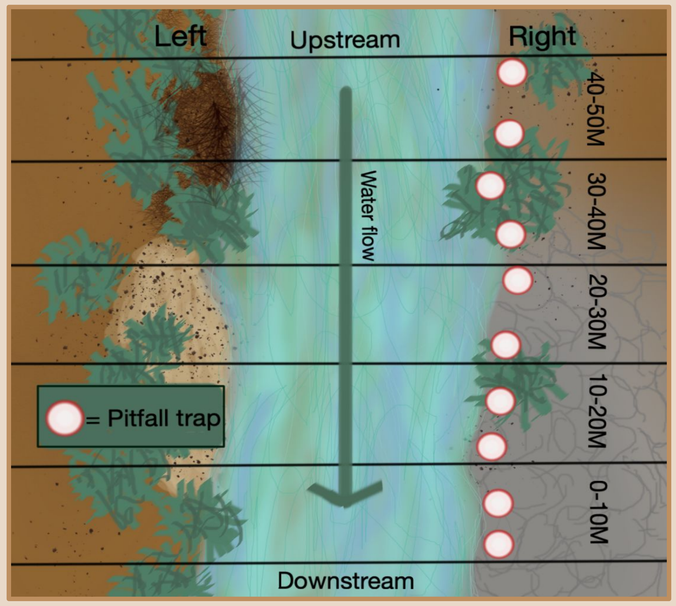

Fig. 2. Diagram of general sampling design

Materials and methods

- We sampled 50m transects in six streams in the greater Atlanta Metro Region.
- Each transect was divided into 5 sections and systematically searched for web-weaving spiders (Family Tetragnatha).
- Ground-dwelling fishing spiders (Family Pisauridae) were sampled using pitfall traps were deployed every ~5m, approximately 10 cm from the edge of the stream (Fig.2).
- Habitat characteristics (% overhanging veg., slope, and stability) were mapped in each of the 10m transects.
- Relationships between our continuous variables (spider density and slope of riparian zone/% overhanging, % overhang and slope of riparian zone)vegetation were tested using GLMS.
- Relationships between continuous and categorical variables (Average number of spiders and slope stability) were tested using ANOVA.

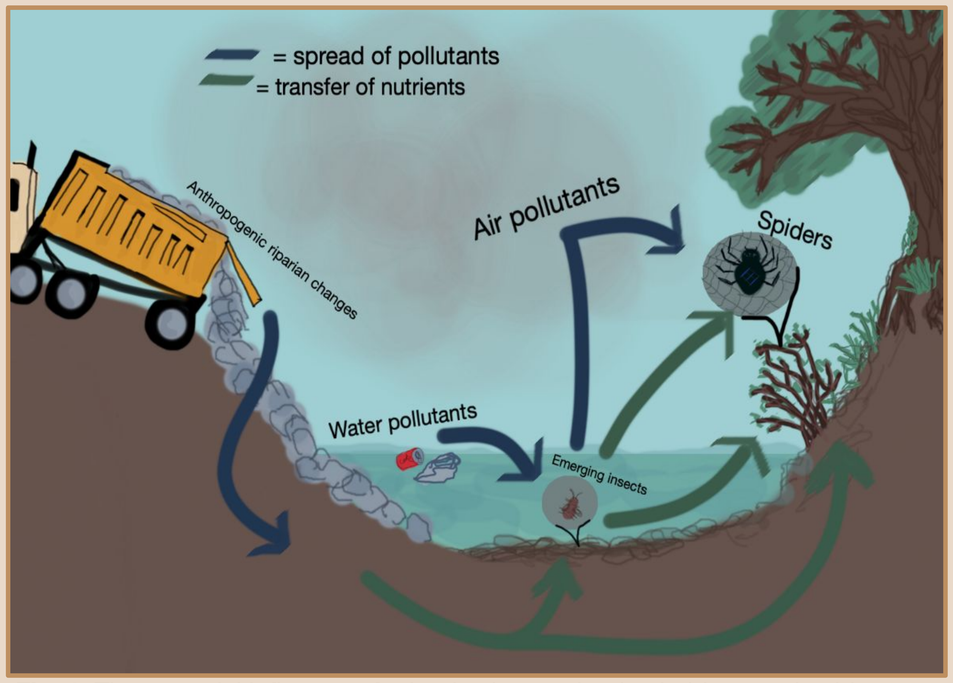

Fig. 1. The potential influence of urbanization on riparian habitats and spider communities.

Results

- We collected a total of 55 spiders.
- The number of spiders collected among sites was variable (mean: 9; min.: 2; max.: 23).
- Though they were seen in each site, only 1 fishing spider was captured using pitfall traps; thus, we excluded them from the analysis.
- Web weaving spider density was positively correlated with percent of overhanging vegetation in the riparian area ($R^2 = 0.64$, $p < 0.001$). However, there was no significant relationship between either slope or stability and spider density.
- Overhanging vegetation was also positively related to the slope of riparian zone ($R^2 = 0.20$, $p < 0.01$).

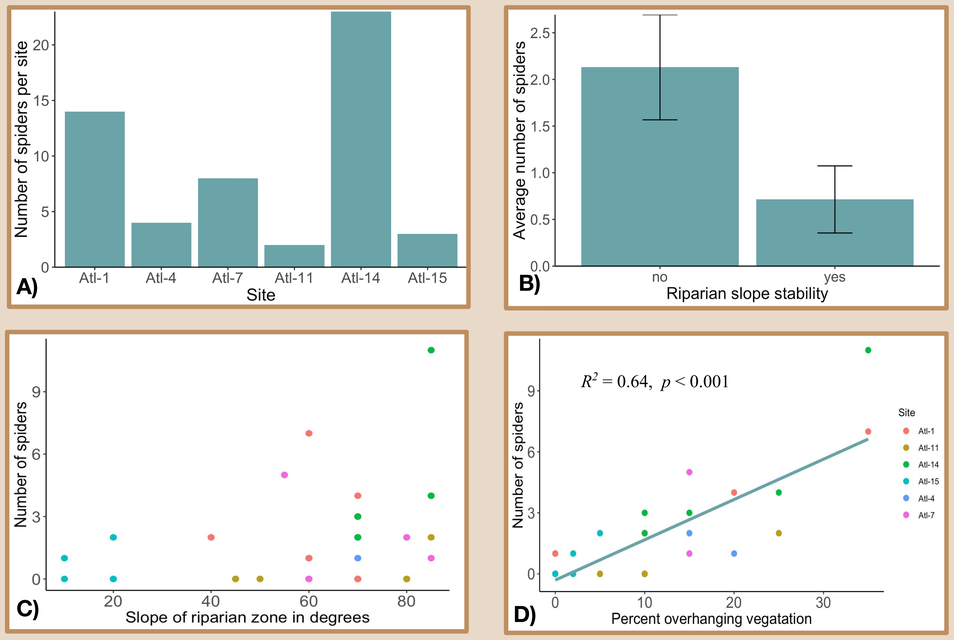

Fig. 3A, 3B, 3C, 3D. The number of web-weaving spiders collected at each site (3A). Relationship between average number of spiders collected in a site and slope stability (3B). Relationship between number of spiders collected in a transect and the slope of the riparian zone (3C). Relationship between number of spiders collected in a transect and percent overhanging vegetation (3D). Different colors in 3C and 3D indicate site numbers.

Discussion

- As we predicted, there was a positive correlation between percent overhang and spider density among our transects.
- There was high variability in spider densities and in the amount of overhanging vegetation among transects within a given site.
- Positive relationships between overhanging vegetation and bank slope indicate there may be potentially important interactions between physical and biological characteristics of riparian areas that mediate spider population structure.

Fig. 4. Depiction of *Tetragnatha*, the most common genus found in this study.

Future

- This project was one component of a larger project examining how local (reach-scale) factors interact with regional (watershed-scale) patterns of urbanization to influence aquatic and riparian invertebrate populations.
- Future work should examine relationships between physical and biological characteristics in sites that are characterized by vertical banks (~90 degree angles), as these are conditions that may exclude riparian vegetation and are often associated with urban streams.
- We will identify the gender and species of the spiders collected to assess the impact of reach-level characteristics on spider diversity and demographics.

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For further information

Please contact *lily.tanner17@ncf.edu*. More information on this and related projects can be obtained by visiting cappslab.ecology.uga.edu