

Directed Seed Dispersal of Cedar Trees in a Disturbed Environment

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- Effective seed dispersal important for plants
- Directed dispersal hypothesis:
Seeds dispersed to locations in which seedlings have high survivorship.
- Important for disturbed ecosystem recovery.
- Hypothesis:
DePauw University Nature Park- the pattern of cedar saplings and sycamore trees appears to indicate that directed dispersal of cedar seeds by birds may be occurring.



Methods

Collected data on 487 cedar trees in a one hectare plot. Measured height, location (under a sycamore or in open), distance and compass direction from trunk. Also measured canopy area of sycamore trees.

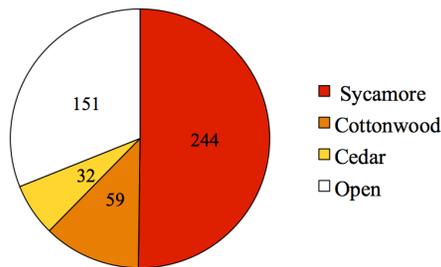


Figure 1. Frequency of cedar saplings in different locations (under different types of trees or in the open).

Results

- More cedar saplings are located underneath sycamores than in other locations (Figure 1).
- This is consistent with the directed dispersal hypothesis, that seed rain is non-random, as it occurs more frequently under perches.

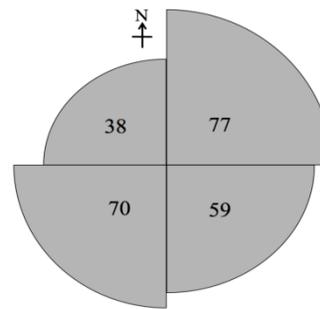


Figure 2. Frequency of cedar saplings under sycamore trees relative to compass direction. The cedars were not distributed randomly. ($\chi^2=14.26$, $df=3$, $p=0.0026$)

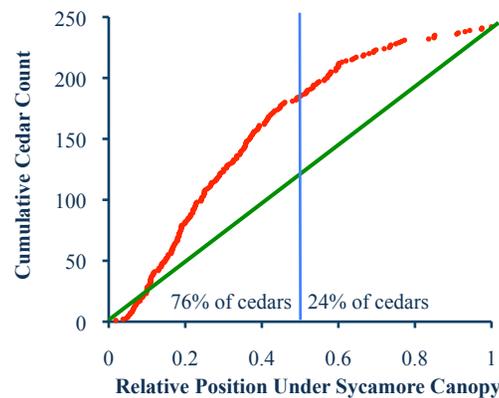


Figure 3. Frequency of cedar saplings in inner vs. outer canopy. (Kolmogorov-Smirnov test significant at $p<.005$)

- More cedar saplings are clustered in the northeast quadrant (Figure 2).
- This is likely due to the effects of shading.
- More cedar saplings are clustered in the inner canopy of the tree (Figure 3).
- Again, this is likely due to shading, as the inner canopy provides more protection from the heat of the sun.



Discussion

- The directed dispersal hypothesis is supported
- Sycamore trees serve as perches for birds, which then deposit cedar seeds non-randomly.
- Survival of cedar saplings is high under sycamore trees.

NE quadrant - protection from the hot summer sun, exposure to cool season sun

NW quadrant - exposure to the afternoon summer sun, less access to sun at other times

- Cedar saplings are clustered in the protected inner canopy of sycamore trees
- Thus, cedar seeds are delivered to locations in which seedling survival will be relatively high.

Acknowledgments

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