

Caching by urban squirrels as a link between research and education

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ECOLOGY HAPPENS EVERYWHERE

Much has been discussed about how our society is increasingly distanced from nature and the outdoors¹. This "Nature-deficit Disorder" is even more prevalent in urban areas, where there is a perception that ecological processes and wildlife are alien subjects. However, urban ecology provides an exciting opportunity for middle school, high school, and college students to engage with wildlife in the outdoors. Since Gray and Fox Squirrels are among the most conspicuous members of the urban wildlife assemblage, we encouraged students in exploring the ecological and evolutionary consequences of scatter hoarding² and seed dispersal using a fun and engaging outdoor methodology. Field studies promoted critical thinking in students, exploring seed dispersal, re-colonization strategies, and foraging tradeoffs. More basically, students understood that ecology is alive and well, even in a human-dominated urban landscape.

Our **objectives** were to explore

- seed dispersal processes,
- the value of caching to the squirrel,
- the consequence of caching for seed dispersal³ in a urban environment, and
- engage urban students in serious field research.

Students asked

- How far are seeds dispersed?
- Are seeds dispersed evenly?
- Are some seeds consumed, or are all buried?
- What proportion of seeds is buried away from the release point?

METHODS: OUTDOOR FUN WITH NUTS AND SQUIRRELS



Figure 1. Nylon spools of thread are attached to hazelnuts with epoxy, and three spools (500 m each) are placed inside each plastic canister.



Figure 2. Students buried the canisters into the ground. Squirrels, upon finding the nuts, may collect, eat or hide them away. As the squirrel moves the nut, the spool remains anchored in the container, and the thread plays out.



Figure 3. In 8 trials of this exercise, students tracked and monitored the caching behavior of squirrels by following the threads from the release point to where the squirrels either consumed (shell fragments) or buried the nuts.

RESULTS

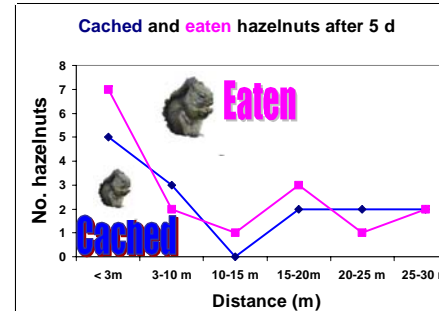


Figure 5. Fate of hazelnuts (cached or eaten) after 5 days of release. Higher proportion of hazelnuts were cached close to the release point, and were eaten as opposed to lower proportion of hazelnuts cached and eaten at longer distances.

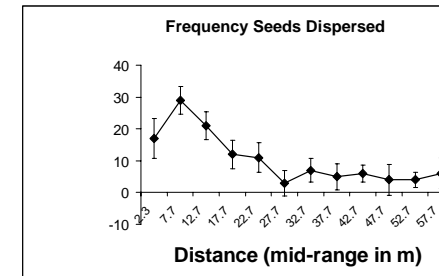


Figure 4. Frequency distribution of seeds (\pm SD) dispersed by squirrels at different mid-range distances (m) from the release point. The number of seeds buried decreased with distance

Table 1. Variables evaluated by students (RP = Release Point)

Variable	Amount
Squirrel's time to find nuts	24 - 48 h
Total No. nuts released	200
% nuts consumed	3%
% nuts cached (buried)	93%
% Buried within 25 m	72%
No. nuts at more than 55 m	5
Proportion eaten < 15 m from RP	33%
Proportion eaten > 15 m from RP	20%

CONCLUSIONS

Students drew these main conclusions :

Consequences of caching on seed dispersal

- Fewer seeds reached farther dispersal distances
- But lower predation at longer distances may promote higher survival and colonization efficiency of new habitats

Promoted critical thinking

To understand how squirrels can potentially help plants re-colonize areas within the human-dominated landscape

Results prompted new discussion

How may seed dispersal influence the colonization of new habitats? How may seed foraging affect the rate of seed dispersal?

Cooperative learning

Students worked together learned how to design an experiment learned to interpret figures and tables appreciated the process of science

This experiment was really cool!
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MORE IMPORTANTLY...

The methodology allowed students to explore the outdoors in an urban environment, and how it is possible to develop rigorous ecological research within a human-dominated landscape.

LITERATURE CITED

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