The presence of generalist plants in urban greenspaces predicts pollinator diversity

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Target Journal: Biology Letters

Word Count: 3427 including figure captions, excluding supplement and bibliography.

Figure Count: 3

Keywords: Mutualistic Networks, Connectedness, Biodiversity, Citizen Science, iNaturalist, Network Hubs

Contributions: JSF and CTC conceptualized the project. JSF developed the hypotheses and drafted the initial analyses. All authors collected data. JSF, BMM, MM, and CTC drafted the manuscript with revisions contributed by all authors.

Acknowledgements: CTC acknowledges that this research was supported in part by the intramural research program of the U.S. Department of Agriculture, Hatch, FLA-FTL-006297. Additionally, this work is supported in part by the U.S. Department of Agriculture, McIntire-Stennis Program, project award no. FLA-FTL-006659. AB and AJM were supported by the Weiner ECOS Student Success Fund at Florida Atlantic University.

Abstract:

Urban greenspaces are increasingly important for pollinator conservation, yet it remains unclear whether pollinator diversity is better predicted by overall plant richness or by the presence of particular plant species with central roles in the pollination network, referred to as hub species. Using community science observations from 39 urban greenspaces in Broward County, Florida, we constructed a regional plant-pollinator metanetwork and identified the five most highly connected plant species as interaction hubs. We then tested whether greenspaces containing more of these hub plants supported greater pollinator richness. Pollinator richness increased with hub plant richness, and this relationship was nonlinear, with evidence of diminishing returns as additional hub species accumulated. The observed hub set explained pollinator richness better than randomly assembled plant sets of equal size, indicating that the effect reflects the network roles of particular plant species rather than the presence of any common taxa. Our results suggest that plant identity and interaction role can outperform plant richness alone in predicting pollinator diversity in urban greenspaces. Regional metanetworks may therefore provide a practical framework for identifying plant species that disproportionately support biodiversity in fragmented urban landscapes.

Introduction

Ecological communities are not simply collections of species, but networks of interactions whose structure shapes persistence, stability, and ecosystem functioning. In mutualistic systems such as plant-pollinator communities, changes in which species are present (i.e., overall species richness) can matter less than changes in who interacts with whom [1]. Interaction structure determines how resources move throughout the environment [2]; fitness for plants [3] and animals; and network stability to disturbance [4]. Yet predicting how mutualistic networks assemble, rewire, and respond to disturbance remains difficult, in part because network structure reflects processes operating across multiple spatial and temporal scales [5,6].

Understanding how plant-pollinator networks assemble is particularly important given their centrality in ecosystem function [7,8]. The structure of plant-pollinator networks predicts whether pollinator species persist in the landscape [9,10], and thus continue to provide critical ecosystem services. Further, many plant-pollinator networks are dominated by generalist pollinators with flexible foraging patterns. These generalist foragers can fluctuate between high individual specialization or generalization based on context [11] and this behavior can change network structure [12,13].

Plants also contribute strong constraints and opportunities for assembly. Plant species differ in the breadth of their visitor assemblages, ranging from interaction generalists to functional specialists, because phenology, floral display, reward quantity and quality, and morphological accessibility determine which pollinator taxa can detect, access, and exploit their flowers [14–16]. As a result, plant identity can structure local pollinator communities by concentrating or partitioning resources across space and time. However, the relative importance of interaction driven assembly processes vs other assembly processes (such as dispersal and patch suitability) is an open question [17]. In theory, a small subset of highly connected “hub” plant species may disproportionately mediate network assembly by attracting diverse pollinator assemblages and creating interaction opportunities among otherwise weakly connected species. Historically, the idea of “magnet species”, i.e., plants that are highly attractive to pollinators and facilitate pollination of co-flowering species has received significant attention [18], but how this phenomenon shapes network assembly is unclear. This role-based perspective predicts that local network structure, and its assembly in metanetworks, may depend more on the presence and abundance of particular plant species than on plant richness alone.

Plant "roles" in regional interaction networks can be operationalized through connectedness—the number of distinct pollinator taxa a plant interacts with across all sites. Because mutualistic networks are typically heterogeneous [19] and nested [20], a small subset of highly connected plant species may function as regional hubs of interaction. When present locally, these hub plants could disproportionately structure pollinator assemblages by providing broadly accessible resources, attracting different assemblages of pollinators. However, they could also drive potentially nonlinear, saturating increases in pollinator richness if they attract strong competitors that limit the presence of other pollinators. Urban greenspaces offer a powerful natural experiment for understanding how communities of plants and pollinators [21], and their associated mutualistic networks assemble in metacommunities. This is because urban greenspaces serve as habitat "islands" that differ in size, composition, ecological quality, management, and connectivity [22,23] .

Here, we use a regional plant-pollinator metanetwork to identify highly connected hub plant species and test whether greenspaces that contain more hub species support greater pollinator richness. To assess whether hubs are unusually informative (rather than any set of common plants), we compare the observed hub set's explanatory power to a null distribution generated by set randomization.

Methods

Study site selection

Our regional network was derived from pollinator and plant observation data from Broward County, Florida, United States. Broward County is Florida's second most populated county and ranks among the 20 largest counties in the United States, with approximately 1.9 million residents. The county spans 342,655 hectares, of which approximately 8.5% consists of water. Much of the western portion of the county is encompassed by the Everglades Wildlife Management Area, while the eastern portion contains a sharply delineated urban matrix characterized by dense residential, commercial, and transportation infrastructure [Figure 1, 24].

We focused on public urban greenspaces within the developed portion of the county [sensu 25], where pollinator communities are embedded within a highly fragmented landscape and where management interventions are most likely to be implemented.

Data sources and processing

iNaturalist data acquisition and filtering

To obtain pollinator and plant occurrence data, we queried the iNaturalist Application Programming Interface (API) on 10 July 2024. We retrieved all "Research Grade" observations (i.e., observations with at least two-thirds agreement on taxonomic identification) from Broward County, Florida (www.inaturalist.org). Pollinator records included observations from the superfamily Apoidea, family Bombyliidae, subfamily Cetoniinae, order Lepidoptera, and subfamily Lepturinae. We also retrieved all Research Grade angiosperm observations from the same geographic area.

Using the iNaturalist API allowed us to precisely filter observations by taxonomic group and to obtain metadata for each observation, including image availability, image URLs, species identification, observation date, and geographic coordinates. We then filtered observations to include only those overlapping with mapped urban greenspace boundaries (N = 639). Urban greenspace shapefiles were obtained from [26]. To ensure sufficient sampling depth, we further restricted analyses to greenspaces with at least 100 combined angiosperm and pollinator observations, resulting in a final dataset of 39 urban greenspaces distributed across Broward County.

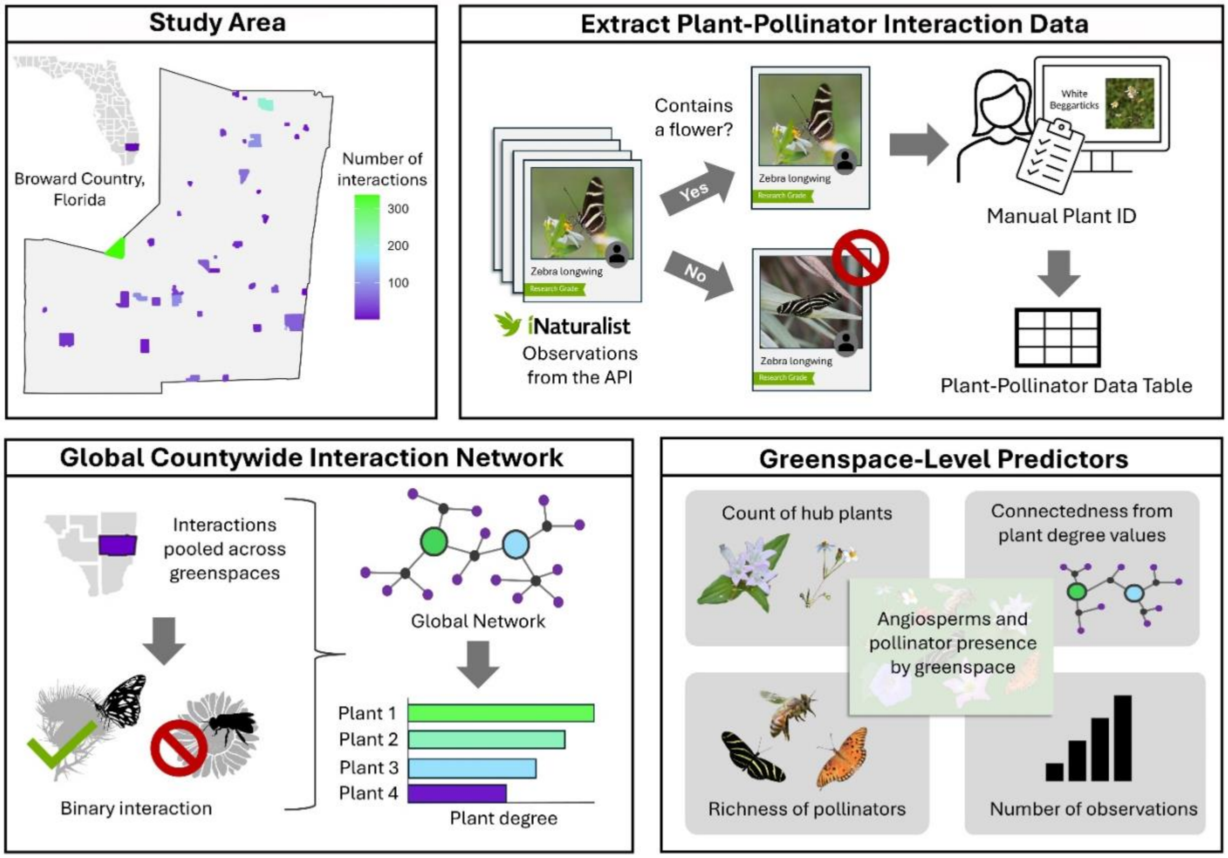

Figure 1. We combined iNaturalist observations, manual image review, and plant identification to construct a curated plant-pollinator interaction dataset. Interactions were pooled across Broward County urban greenspaces to build a regional bipartite network and identify highly connected hub plants. All iNaturalist occurrence records in these greenspaces were then used to calculate greenspace-level predictors, including hub plant richness, connectedness, pollinator richness, angiosperm richness, and sampling effort.

Curated plant-pollinator interaction dataset

To characterize plant connectedness within a regional flower-visitor network, we used a curated dataset of plant-pollinator interactions compiled from photo-vouchered observations (Supplemental Materials 2). To identify observations that contained images of pollinators visiting flowers, we manually reviewed images from all observations and denoted whether the pollinator was on a flower. Interactions were then taxonomically harmonized to plant species and pollinator taxon. Pollinator identifications came from iNaturalist, while plant species identifications were made manually by the authors. We were able to identify 1,362 observed interactions across 406 plant-pollinator pairs.

Construction of the regional interaction network

We constructed a bipartite plant-pollinator interaction network using the curated interaction dataset. Each unique plant-pollinator pair was treated as a binary interaction, regardless of how many times the interaction was observed, to avoid conflating observer effort with ecological interaction strength. All interactions were pooled across greenspaces to generate a single global network representing the regional structure of flower-visitor associations.

Plant connectedness was quantified as degree, defined as the number of distinct pollinator taxa interacting with a given plant species in the global network. Degree was chosen because it is intuitive, biologically interpretable, and directly reflects the breadth of pollinator associations. We identified the five most highly connected plant species (highest degree) in the global network and refer to these as “hub plants.” Hub plants were used to construct a greenspace-level predictor of hub presence (below) and to facilitate visualization and interpretation.

Greenspace-level predictors derived from independent plant occurrence data

To quantify plant presence within each greenspace independently of the curated interaction dataset, we used angiosperm observations from the county-wide iNaturalist dataset. For each greenspace, we compiled a list of research-grade angiosperm species observed at least once, treating plant occurrence as presence-absence.

We then generated two complementary greenspace-level predictors. For each greenspace, we counted how many of the five hub plant species (defined from the global interaction network) were present based on iNaturalist angiosperm occurrences. This produced a discrete variable ranging from 0-5 (hub plant richness). Additionally, we calculated continuous connectedness within plant-pollinator interaction networks. As a sensitivity analysis, we calculated a continuous metric of greenspace-level connectedness based on the degree values of plants present in each greenspace. Specifically, for each greenspace we identified the five most connected plant species present (based on global degree) and computed the mean degree of those species (hereafter top 5 mean degree). This metric allows the most strongly connected plants within a greenspace to dominate the predictor while avoiding reliance on a single fixed hub list.

Pollinator species richness was calculated for each greenspace using the independent iNaturalist dataset by counting the number of distinct pollinator taxa observed. To account for uneven sampling effort inherent in community science data, we quantified sampling effort as the total number of pollinator observations per greenspace and included the natural logarithm of this value (log(observations)) as a covariate in all models. We also calculated angiosperm species richness per greenspace, defined as the total number of unique angiosperm Research Grade species, to control for broader plant diversity effects unrelated to hub identity.

Statistical analysis

We evaluated the relationship between hub plants and pollinator richness using generalized linear models with a negative binomial error distribution to account for overdispersion in count data. Pollinator species richness was modeled as a function of hub plant richness (primary predictor), pollinator sampling effort (log-transformed), and angiosperm species richness. We included a quadratic term for hub plant richness to allow for saturating or nonlinear relationships, reflecting the hypothesis that additional hub species may yield diminishing returns for pollinator diversity. As a secondary analysis, we fit an analogous model replacing hub plant richness with the continuous connectedness metric (top 5 mean degree) and its quadratic term, to evaluate whether results were robust to a continuous summary of connectedness among plants present.

As a sensitivity analysis, we varied the definition of hub plants from the top 3 to the top 10 species ranked by global degree in the regional network. For each hub-set size, we recalculated park-level hub richness and refit the primary negative binomial model including linear and quadratic hub-richness terms, pollinator sampling effort, and angiosperm richness. We summarized sensitivity by extracting the linear hub-richness coefficient from each model and converting it to an incidence rate ratio (IRR) with 95% confidence intervals.

To assess whether the observed association between hub plants and pollinator richness was stronger than expected by chance, we conducted a permutation test. We repeatedly generated random sets of plant species equal in number to the hub set (five species), recalculated greenspace-level pseudo-hub counts for each random set using the independent plant occurrence data, and refit the same negative binomial model. For each permutation, we calculated a likelihood ratio statistic comparing models with and without the hub predictor. The observed likelihood ratio statistic was compared to the null distribution from randomly generated plant sets to obtain an empirical p-value. Model assumptions were evaluated using simulated residuals generated with the DHARMa package, including tests for dispersion, zero inflation, and residual structure [27]. All models were fitted in R using negative binomial regression [MASS; 28].

All analyses were conducted in R version 4.5.2 (R Core Team, 2025). Code and data are available in GitHub https://github.com/jacobsfrancis/hub_plant_analysis and will be archived in a Zenodo repository following acceptance of this manuscript.

Results

Greenspace-level dataset and predictors

Our curated regional network included 142 plant species and 91 pollinator species. The county-wide iNaturalist greenspace diversity dataset comprised 4,404 pollinator observations (251 taxa) and 12,490 angiosperm observations (691 taxa) indicating that there were plants and pollinators observed in greenspaces that had no observed interactions. After filtering to greenspaces with complete data for all covariates, all 39 greenspaces were retained for analysis. Hub plant richness (number of hub species present) ranged from 1 to 5 across greenspaces, while observed pollinator richness ranged from 2 to 97 species. Angiosperm richness ranged from 5 to 218 species.

Global plant-pollinator network structure

The curated plant-pollinator dataset yielded a global bipartite interaction network in which plant connectedness (degree) was highly right-skewed, with a small number of plant species interacting with a disproportionately large fraction of pollinator taxa (Figure 2 and S2). The five most connected plant species (“hub plants,” defined as the top-5 by global degree) were *Bidens alba* (degree = 47), *Richardia grandiflora* (37), *Spermacoce verticillata* (32), *Hamelia patens* (23), and *Stachytarpheta jamaicensis* (16).

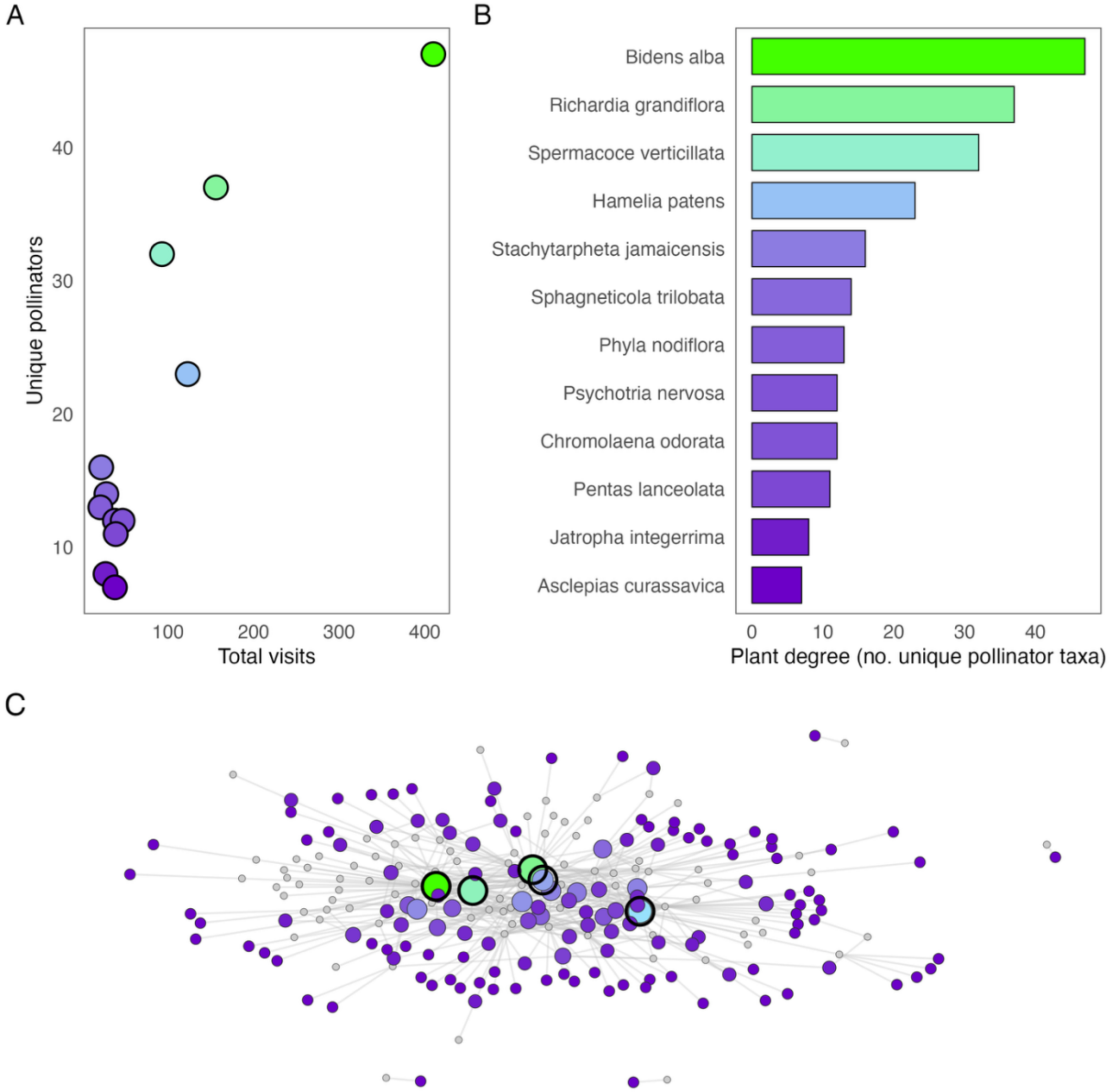

Figure 2. Global plant-pollinator network structure and identification of hub plants. (A) Relationship between total recorded flower visits and the number of unique pollinator taxa observed per plant species in the curated interaction dataset. (B) Plant degree (number of unique pollinator taxa) by plant species (ranked), highlighting a small subset of highly connected plants. (C) Visualization of the pooled county-wide bipartite interaction network (plants and pollinator taxa), with hub plants (top five plants by global degree) emphasized; edges represent unique plant-pollinator interactions treated as binary links. Together, panels illustrate the strongly right-

skewed distribution of plant connectedness and motivate hub-based predictors used in greenspace-level analyses.

Primary model: hub plant richness predicts pollinator richness

Observed pollinator richness increased with the number of hub plant species present, and this relationship was nonlinear (Figure 3). In the primary negative binomial model including sampling effort and angiosperm richness as covariates, the linear effect of hub plant richness was positive and significant ($\beta = 0.544$, SE = 0.165, $z = 3.29$, $p = 8.26\text{e-}04$; IRR = 1.72, 95% CI: 1.25-2.39; Table S1), indicating that each additional hub species present was associated with a 72% increase in expected pollinator richness (linear IRR = 1.72). The quadratic term was negative and significant ($\beta = -0.076$, $p = 1.71\text{e-}03$), consistent with diminishing returns (a decelerating, hump-shaped relationship).

Sensitivity analyses showed that the positive association between hub richness and pollinator richness was qualitatively consistent across small hub sets, with the strongest effect sizes observed when hubs were defined using the top 3, 4 (only marginally so), 5, and 6 plant species by global degree (Fig. S1).

As expected, sampling effort was the strongest predictor of observed richness ($\beta = 0.610$, IRR = 1.84, $p < 0.001$). In contrast, angiosperm richness was not significantly associated with pollinator richness after accounting for hub plant richness and effort (Table S1).

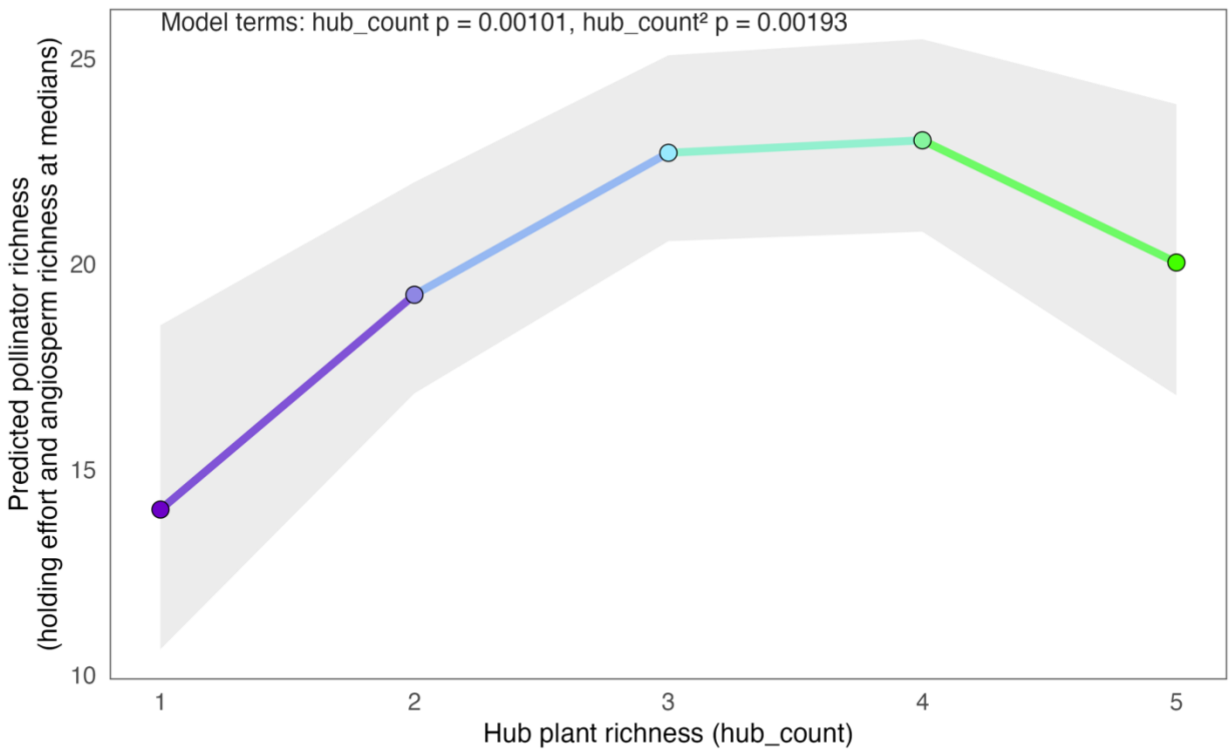

Figure 3. Hub plant richness predicts pollinator richness after accounting for sampling effort. Partial effect of hub plant richness (hub plant richness; number of the five globally most connected “hub” plant species present in a greenspace) on predicted pollinator species richness from the primary negative binomial model. Predictions are shown while holding pollinator sampling effort (log(observations)) and angiosperm richness at their median values. Points/line indicate model predictions and the shaded band shows the 95% confidence interval. P-values for the linear and quadratic hub plant richness terms shown on the plot are Wald z-test p-values from the negative binomial model. Results were consistent when using a continuous measure of greenspace-level connectedness. (Figure S3)

Are hub plants unusually informative?

To test whether the observed hub set explains more variation in pollinator richness than expected by chance, we conducted a set-randomization permutation test. The observed likelihood-ratio statistic for the true top-5 hub set (LR = 8.75) exceeded the vast majority of the null distribution generated from 5,000 random plant sets of the same size (empirical simulation-based p = 0.005); Figure S2). This indicates that the plants identified as hubs based on the global interaction network explain more variation in pollinator richness than would be expected for randomly selected plant species.

Discussion

Using a regional metanetwork, with 142 plant species, 91 pollinator species, and 406 unique plant-pollinator pairs, we found that greenspaces containing more of the most highly connected plant species (hub plants) supported greater pollinator richness. The effect was substantial: predicted pollinator richness increased from roughly 14 species in greenspaces with one hub plant to about 23 species in those with four hub plants, corresponding to an increase of approximately 60%. The explanatory power of the observed hub set exceeded that of randomly assembled plant sets of equal size, indicating that the result reflects role-based properties of particular plant species rather than simply the presence of any common or widespread taxa. This aligns with broader mutualistic network theory showing that species-rich plant-pollinator communities are typically organized around a highly connected generalist "core," and that hubs/connectors can be structurally influential [19,20].

Highly connected plant species may increase pollinator richness because they act as broad-access floral resource hubs. By a mechanism conceptually similar to the "magnet species effect" which predicts that attractive plants can facilitate the pollination of neighbors by pulling in more pollinators to a patch [18], these hyper generalist plants may attract visitors into a metacommunity and may also create conditions under which additional, less common taxa can persist [29–31].

The saturating shape of this relationship is also biologically plausible. The first few hubs likely increase resource breadth and/or greenspace detectability for mobile pollinators, whereas additional hubs may yield diminishing gains because pollinators were already captured by a generalist "core". These diminishing returns are consistent with prior theory and simulations showing that intact or restored mutualistic networks often contain redundancy [32] and that robustness depends strongly on a relatively small set of highly linked species [33]. Thus, hub plants may disproportionately elevate pollinator diversity, but with diminishing returns as local communities approach the limits imposed by overlap, competition, and patch context.

It's widely accepted that plant richness promotes pollinator diversity because more plant species provide a greater variety of floral resources [34,35]. However, our results suggest that plant identity and network role can matter more than richness alone [similar to findings in 36]. After accounting for overall angiosperm richness, greenspaces containing more highly connected hub plants still supported greater pollinator richness, indicating that the effect was not simply driven by larger local plant species pools. In this sense, plant richness and hub roles are not interchangeable: richness reflects the size of the local species pool, whereas hub roles reflect the functional position of particular species within the interaction network.

For managers hoping to maximize pollinator diversity on their lands, our results suggest that planting, or encouraging the growth of a small number of well-chosen highly connected plant species into urban greenspaces may disproportionately enhance pollinator diversity relative to simply increasing overall plant richness, for example *Hamelia patens* or *Stachytarpheta jamaicensis*. The saturating nature of the relationship supports the idea that a targeted effort could have outsized impacts [37–39]. This could sometimes mean adding new species to the greenspace's plant structure, but it could also look like adopting management practices (e.g., prescribed fire, or mowing regimes) to maximize the opportunities for specific target species to flourish.

An important caveat is that highly connected species are not necessarily conservation-priority species. In our system, some hub taxa from our metanetwork are invasive species (e.g. *Richardia grandiflora*). In many regions, plant-pollinator network hubs can be non-native or invasive "super-generalists," in part because disturbance tolerance and high local abundance increase encounter rates and broaden interaction opportunities [40–42]. Given the well-documented [43,44] and theorized [45] negative impact of alien plants, especially via reduced native pollination and reproduction [46] despite occasional facilitative "magnet" effects, our results should not be interpreted as recommending introduction of invasive hubs. Instead, the most defensible implication is to identify native functional analogs that occupy similar interaction roles within regional metanetworks, or to manage for native hub persistence.

Because our analyses relied on iNaturalist observations, the interaction network reflects known biases in community science data, including uneven sampling effort, detectability differences among species, and preferential documentation of conspicuous taxa [47,48]. These processes could systematically underrepresent cryptic or less frequently photographed interactions, potentially affecting estimates of plant connectedness. However, if such biases are consistent within a region, relative differences among greenspaces in hub presence and pollinator richness can remain informative, particularly when analyses include sampling-effort controls and given our conclusions are based on role-based signals in the observation network rather than complete interaction censuses.

While our study focused on Broward County, similar patterns likely extend to other systems. The mechanism underlying the relationship between hub plant richness and pollinator diversity is still uncertain, but highly connected plants may promote richer pollinator assemblages by providing reliable resources, attracting diverse visitors, and helping sustain both generalist and specialist species. Accordingly, role-based predictors derived from regional metanetworks may prove useful across landscapes where plant-pollinator interactions are strongly uneven among species. Because our analysis was built from iNaturalist citizen science data, it also demonstrates that both this approach and its key insights are readily transferable to other regions.

Data Accessibility

Data and code supporting this article are available at https://github.com/jacobsfrancis/hub_plant_analysis_pub. Upon acceptance, the repository will be archived in Zenodo and the DOI will be added.

Competing Interests

We declare no competing interest

AI Declaration

OpenAI's ChatGPT-5.5 thinking model was used between February 2026 and May 2026 to edit manuscript text for clarity, troubleshoot R code, and verify consistency between reported statistics and model outputs. The tool was not used to generate the research idea, conduct analyses, interpret results, or draft the initial manuscript. All AI-assisted edits and outputs were reviewed and verified by the authors.

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Supplemental Materials 1: Supplemental Figures and Tables

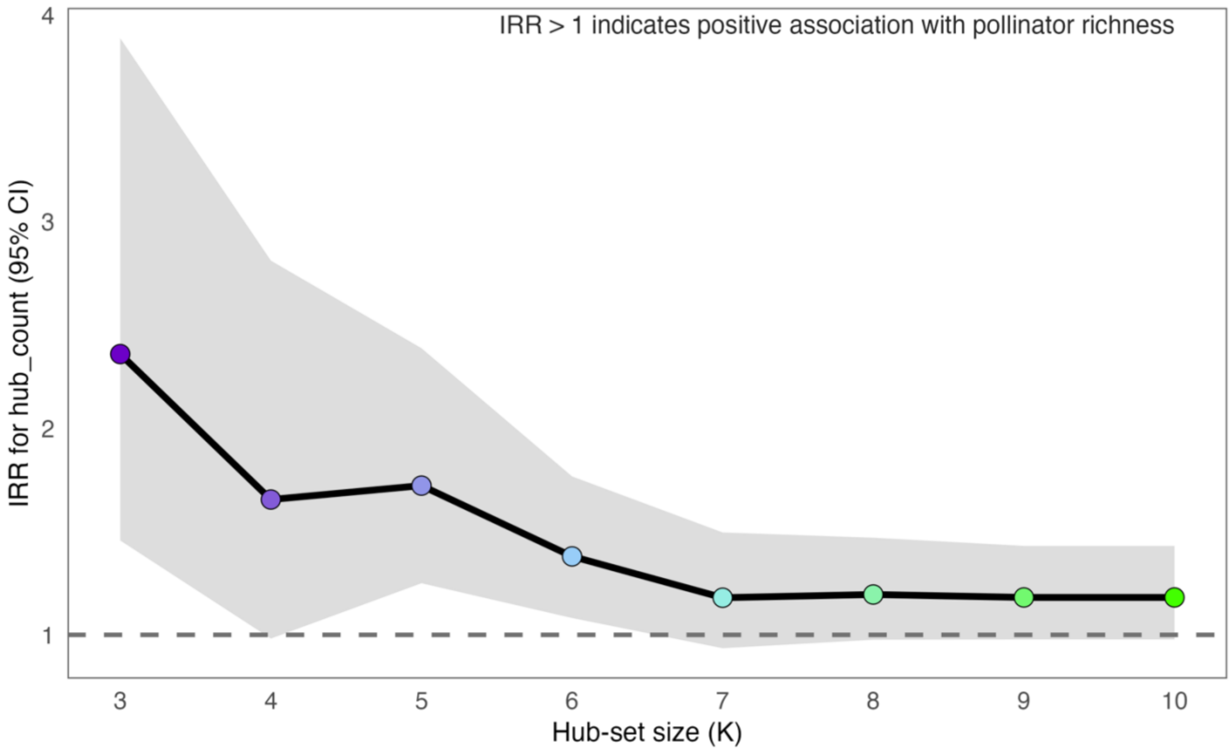

Figure S1. Sensitivity of the hub effect to hub-set size. Incidence rate ratios (IRRs) for the linear effect of hub richness on pollinator richness across sensitivity analyses in which “hub plants” were defined as the top *K* most connected plant species in the regional plant-pollinator metanetwork (*K* = 3-10). For each value of *K*, hub richness was recalculated for each greenspace and a negative binomial model was fit including hub richness, its quadratic term, pollinator sampling effort, and angiosperm richness. Points show the estimated IRR for the linear hub-richness term and the shaded band indicates 95% confidence intervals. The dashed horizontal line at IRR = 1 indicates no association with pollinator richness. Positive effects were strongest when hubs were defined using relatively small sets of the most highly connected plants (approximately the top 3-6 species), and weakened toward 1 as additional, less-connected plant species were included, indicating that the predictive signal is driven primarily by the most strongly connected regional hub plants.

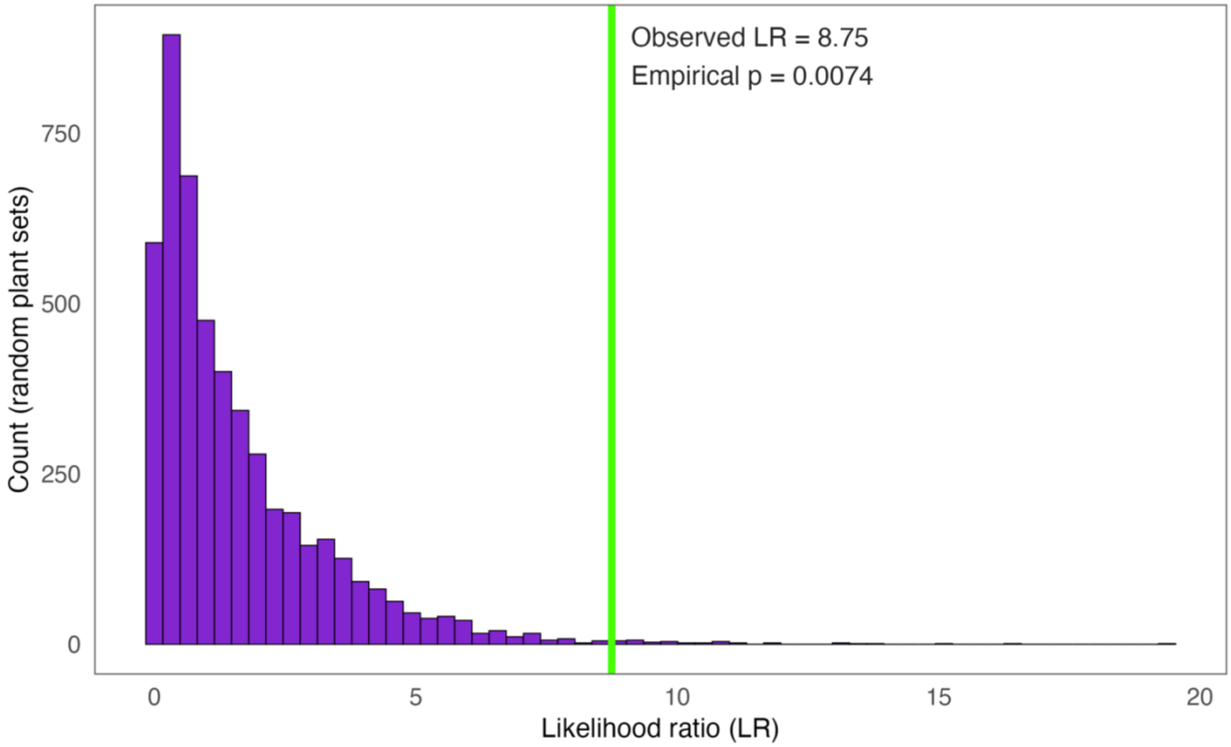

Figure S2. Hub plants outperform random plant sets in predicting greenspace-level pollinator richness. Null distribution of likelihood-ratio (LR) statistics from a set-randomization permutation test comparing negative binomial models with and without the hub predictor. For each of 5,000 permutations, the five hub plants were replaced with a random set of five plant species from the same species pool, greenspace-level “hub plant richness” was recomputed using independent plant occurrence data, and the LR statistic was calculated from nested models. The vertical line indicates the observed LR for the true hub set (LR = 8.75); the empirical one-sided p-value (p = 0.005) is the proportion of randomized plant sets with LR ≥ observed.

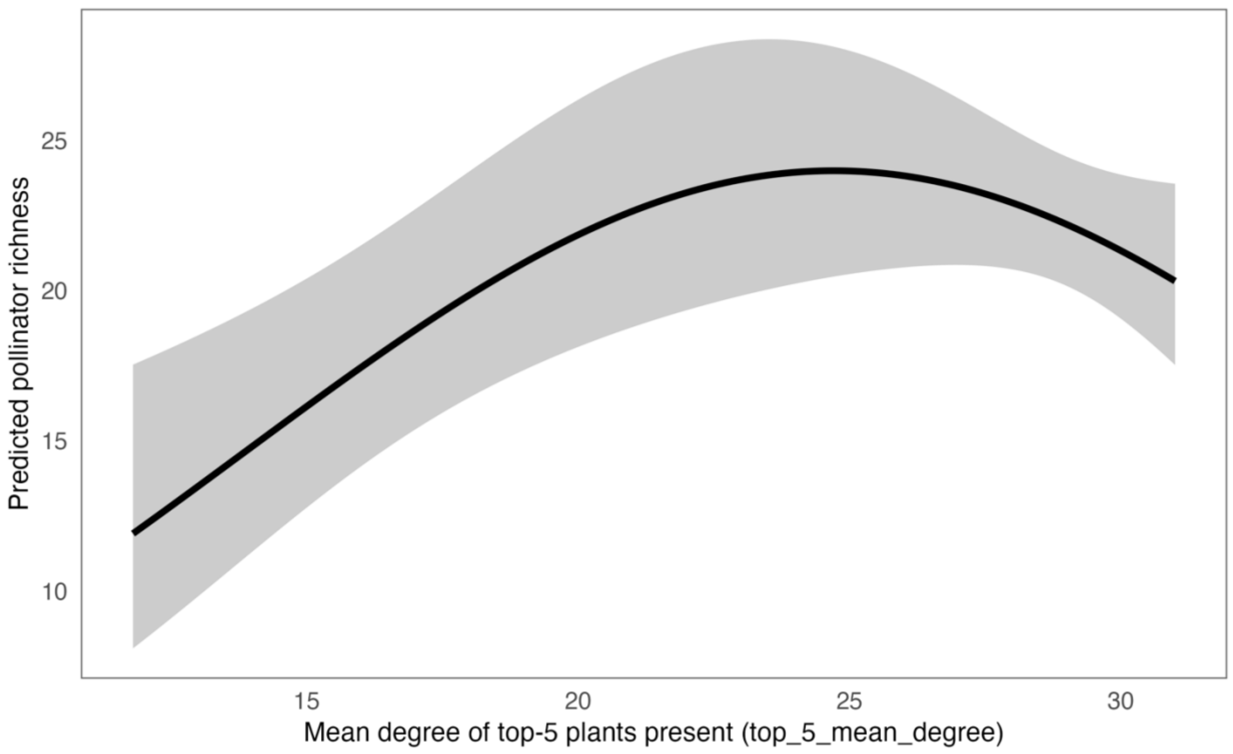

Figure S3. Robustness check using continuous plant connectedness. In a secondary model that replaced *hub plant richness* with top 5 mean degree (the mean global degree of the five most-connected plant species present in each greenspace), top 5 mean degree was positively associated with pollinator richness (β = 0.208, IRR = 1.23, $p = 0.008$) and the quadratic term was negative and significant, consistent with a nonlinear, saturating relationship between plant connectedness and pollinator diversity. Plot: Partial effect of top 5 mean degree (mean global degree of the five most-connected plant species present in each greenspace) on predicted pollinator richness from the secondary negative binomial model; shaded band shows 95% confidence intervals with other covariates held at their median values.

Table S1 Primary model results: Negative binomial model coefficients are shown on the log scale with corresponding Wald χ^2, *p-value*s, incidence rate ratios (IRRs), and 95% confidence intervals. All values are based on type II sums of squares (i.e. marginal on all other terms). Significant terms are shown in bold.

Term	Estimate	Std. Error	LR χ^2	p	IRR	IRR CI (min - max; 95%)	
Hub Plant Richness	**0.54**	**0.17**	**11.18**	**8.26E-04**	**1.72**	**1.25**	**2.39**
Hub Plant Richness (quadratic)	**-0.08**	**0.02**	**9.84**	**1.71E-03**	**0.93**	**0.88**	**0.97**
Sampling Effort	**0.61**	**0.04**	**241.22**	**5.59E-49**	**1.84**	**1.70**	**2.00**
Angiosperm Richness	0.00	0.00	0.33	5.66E-01	1.00	1.00	1.00

Supplement 2: Protocol for Tagging Pollinator iNaturalist Images

For this project, we aim to document pollinator interactions with flowers using iNaturalist images. We define pollinators as bees, apoid wasps, bee flies, fruit and flower chafers, and butterflies and moths. This protocol describes how we tagged images with details on whether a flower is visible, the insect's life stage (adult or immature), and the insect's behavior.

Data is collected via a Google Sheets database. Below is an overview of the column names and how to best fill out each blank column (image number, flower visible, life stage, insect behavior, and notes):

id: Unique number that identifies the observation.

park_name: The name of the park where the pollinator images were obtained.

observed_on: The date the iNaturalist observation was taken on. This column can be used to verify that the URL is directing you to the correct observation.

taxon_name: The scientific name of the organism in the iNaturalist observation. This column can be used to verify that the URL is directing you to the correct observation.

URL: This is the URL link to the observation. Click on this link to view the observation and fill out the following columns.

number_of_observation_photos: This column indicates the number of photos in each observation. Please refer to this field when completing the 'Image Number' column.

Image Number: Observations may have multiple images. For tagging purposes, select the most representative image in each observation.

If available, select the image that best depicts a pollinator interaction. Look for an image where a flower is visible and shows the best insect behavior, with the insect perched on a flower being the best choice, followed by perched near a flower or flying (depending on the distance to the flower, with images of insects closer to a flower ranking higher), and 'other (add note)' being the least preferable. If multiple images meet these criteria, choose the first suitable image. If none of the images have a visible flower, then simply choose the first image.

After selecting your reference photo, please enter the corresponding image number in this field. The image number should match the order in which the images are displayed on iNaturalist (refer to the image on the right). If the observation has only one image, enter '1' in this field. Ensure that the image number you enter is equal to or less than the number listed in the 'number_of_observation_photos' column.

Flower Visible: A yes/no field to denote if a flower is visible in the iNaturalist image. If a flower is visible in the image, no matter where the insect is located, select “Yes.” If you do not see a flower, select “No.” If you are unsure, select “I don’t know.”

Life Stage: This field is used to denote if the individual is an adult or immature. If the image is of insect eggs, larva (i.e., a caterpillar), or pupa then select “Immature.” If the image is of a mature insect that has wings, then select “adult.” **Note:** Only fill in this field if there is a flower visible in the image.

Insect Behavior: Use this field to denote the behavior of the insect: perched on flower, perched near flower, flying, or other (add note) (see below for definitions). **Note:** Only fill in this field if there is a flower visible in the image and the insect is an adult.

- Select “Perched on Flower” when the insect is directly perched on the flower or on nearby surface where at least part of the insect is touching the flower.
- Select “Perched near Flower” when the insect is perched on a surface near the flower, but is not touching the flower.
- Select “Flying” when the insect is flying near the flower.
- Select “Other (add note)” if the insect does not fit into any of the other categories. Then, provide a brief description of the behavior in the “Notes” column.

Notes: Use this column to add any additional notes about the observation. This column is optional unless you select “Other (add note)” for insect behavior. In this case, briefly describe the insect behavior in the observation.

Entered by: Enter your name in this column to indicate that you entered the data for this observation.