Linking Homeowners Associations with Biodiversity: A Case Study in Phoenix, AZ

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BACKGROUND

As urban diversity continues to decline, identifying ways to improve environmental conditions for native wildlife is one of this century's greatest conservation challenges. **Conservation Developments** constitute a novel approach to reconcile ex-urban development and the integrity of the environment through the designation of protected open space. However, for much of suburbia, the amount of land designated as open space is significantly less than the amount designated for yards and gardens. Furthermore, the patches of open space that do exist may be too small or discontinuous to achieve biodiversity goals. Focusing wildlife management efforts in yards and gardens has the potential to alleviate some of the pressures of degraded habitat in urban areas (Lerman and Warren *in press*).

Increasingly, residential landscapes are privately developed and managed by a **Homeowner's Association (HOA)** via the legally enforceable rules and regulations documented in **Covenants Conditions and Restrictions (CC&Rs)** and additional landscaping guidelines documents. The approach humans use to manage yards and gardens is often at odds with natural processes and ecological function (Nassauer 1995). For example, humans remove or replace native plant communities with exotic trees, lawns, and impervious surfaces. In addition, yards and gardens receive a high level of maintenance and exhibit orderliness and uniformity (Nassauer 1995). This mismatch between management practices and natural ecological processes can be attributed to management goals associated with residential land uses (i.e. aesthetics) that are distinct from conservation priorities. As a consequence, some residential areas might be unsuitable for native species, thus leading to a decline in urban diversity.

RESEARCH QUESTIONS

Do HOA neighborhoods have greater levels of bird, plant and arthropod diversity?

What strategies can HOAs adapt to improve conditions for suburban biodiversity?

METHODS

1. Three CAP LTER monitoring data sets
   - Bird monitoring: 39 PASS neighborhoods, 15 minute point counts, 2006 - 2008
   - Arthropod sampling: 34 PASS neighborhoods, sweep net sampling, 2005
   - Plant surveys: 35 PASS neighborhoods, 30m radius plant community inventory, 2005
2. Calculate Diversity Indices (Shannon)
   - Half of PASS neighborhoods belong to an HOA
   - Compare diversity between HOA and non HOA neighborhoods using t-tests
3. Link HOA landscaping features with ecological function
   - Suggest management modifications that will improve conditions for native wildlife (Figure 1).

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LANDSCAPING FEATURES

Ecological Consequences
- Shrinks vegetation area
- Difficult for nesting and ground foraging
- Pesticide application kills target and beneficial insects
- Loss of species in yards and gardens

Benefits for Homeowners
- Curb appeal
- Pruning shows intention
- Upholds 'ecology of prestige' (Grove et al. 2006)

Ecological Benefits
- Denser vegetation for increased nesting and foraging for birds
- Greater opportunity to restore trophic dynamics
- Yard more closely mimics wildlands
  → **Increased Native Diversity**

Benefits for Homeowners
- Increase positive human nature interactions
- Decrease need for pest control
- Market HOA as a Sustainable Site (Figure 3)
- Decreased landscaping cost (Morris and Bagby 2008)

Figure 1. Examples of landscaping guidelines and how they impact homeowners, birds and arthropods.

RESULTS AND DISCUSSION

- **Bird Diversity: significantly greater** in HOA neighborhoods (t ratio = 2.61, **p = 0.01**).
- **Plant Diversity: significantly greater** in HOA neighborhoods (t ratio = 2.48, **p = 0.01**). (Figure 2).
- **Arthropod Diversity: did not differ** (t ratio = 0.12, **p = 0.9**).

An active landscaping plan improves bird and plant diversity. Many of the HOA neighborhoods had greater plant richness, thus providing somewhat suitable vegetation for a diverse bird community. However, the specific landscaping activities might explain why arthropod diversity did not improve in HOA neighborhoods. Pruning, the removal of leaf litter and pest control might have more direct consequences for arthropods than birds. In Figure 1, we outline benefits and consequences of landscaping activities for both the homeowner and wildlife.

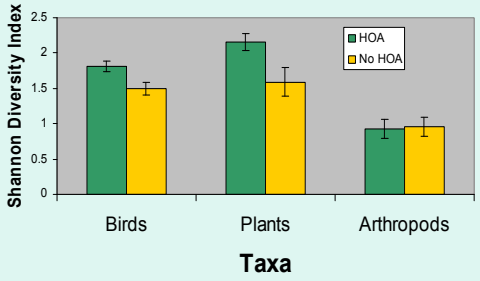

Figure 2. Neighborhoods with an HOA have greater native bird diversity and plant diversity compared with neighborhoods without an HOA. Arthropod diversity did not differ between neighborhood types. SE bars shown.

FUTURE DIRECTIONS

THE SUSTAINABLE SITES INITIATIVE

What is it?
- Certification system to guide landscape design
- Modeled after LEED
- Point system for incorporating sustainable features

How can HOAs adapt these principles?
- Half of the available points coincide with the Landscape Guidelines from a CC&R
- Slightly modify current HOA to include Sustainable Sites Initiative features

Examples of Features
1. Soil and Vegetation
   - 50-100% native vegetation = 34 points
2. Operations and Maintenance
   - Leave organic matter on site, reduce fertilizer application, reduce machine use = 23 Points
3. Monitoring and Innovation
   - CAP Scientists monitor biodiversity in yards
   - CAP Scientists consult with HOA
   - Include signage to indicate the intentionality of not pruning, removing leaf litter, and the exclusive use of native plants

Homeowner's Associations, with their governance, regulatory structure, and focus on landscaping, could potentially integrate Sustainable Sites Initiative (SSI) features. We recognize the challenges in changing the Covenants, Conditions and Restrictions within an HOA. However, with its straightforward guidelines and easy to use point system, the SSI provides a framework to help retrofit existing HOA landscaping plans to incorporate features that improve conditions for both homeowners and native wildlife. Identifying ways to design and manage housing developments is essential for the conservation of urban nature. Modifying landscaping practices could help restore ecological function and thus reverse the loss of urban biodiversity (Figure 4).

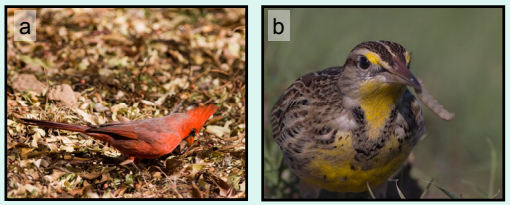

Figure 3. Examples of birds foraging in leaf litter (Northern Cardinal, 3a) and replacing the need for applying pesticides in urban yards and gardens (Western Meadowlark, 3b). The leaf litter also provides microhabitats for ground arthropods. Both of these landscaping features earn points towards Sustainable Sites status. Photos by C. Bang and E. Shochat.

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