Change over time in privately-managed residential vegetation: Resident actions promote dynamic plant communities

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Background
- Residential areas are ~40% of urban land and are individually-managed, with decisions informed by personal and structural factors.
- Managed plant communities provide services, support conservation goals.
- Poor understanding of how managed urban plant communities beyond trees change over time and with management – what happens after conversion to urban land use occurs?

H1: Management for spatial and temporal homogeneity, following lawn management literature (e.g. Robbins 2007; Burr et al. 2018), legacy effects (e.g. Larson et al. 2017; Roman et al. 2018) → Prediction: Low turnover over time

H2: Ongoing small and large-scale changes, "press" disturbances, leading to match with preferences (e.g. Larsen & Harlan 2006; Kendal et al. 2012) → Prediction: Moderate to high turnover over time

H3: Stasis punctuated by major change, "pulse" disturbances, as with landscape conversion (e.g. Pincett et al. 2019) → Prediction: Bimodal, low and high turnover

Managed residential vegetation: NOT static!
Change occurs as both accumulated small changes and larger discrete events.
Opportunity to harness change for conservation – promote positive choices where vegetation is already changing.

To what extent are residential yard plant communities static or dynamic over time?

Data Collection
- Residential front yards in Phoenix, AZ
- 416 in 2008 and 2015
- 100 in 2018 and 2019 (returned 2018 social survey)
- Inventory of woody plant species, to genus
- Bray-Curtis dissimilarity for each yard with itself over time
- Primarily urban and primarily desert plots

Figure 1. Press-Pulse Disturbance framework for residential yard plant communities. Adapted from Collins et al. 2011 and Cook et al. 2012. H1, H2, and H3 map hypotheses onto the framework.

Managed plant communities provide services, support conservation goals.

Human Drivers
- Cultural: aesthetic, cultural, recreational value
- Human Outcomes
- Satisfaction
- Maintenance burden

Ecosystem Services
- Regulating: nutrient retention, climate control, air quality, water management
- Provisioning: food production, urban wood

Biophysical Template
- Ecological Disturbance
  - Press Changes: Landscape changes, drought, invasion, pollution
  - Pulse Changes: Climate change, fire, wind, flood

Static Management
- Maintain for consistency, replace with same species

Social Disturbance
- Human Drivers
  - Landscape use: time and resources for management
  - Values, attitudes, and preferences
  - Norms and regulations

Human Outcomes
- Satisfaction
- Maintenance burden

Ecosystem Services
- Regulating: nutrient retention, climate control, air quality, water management
- Provisioning: food production, urban wood

Figure 2. Dissimilarity of woody plant communities at the genus level in Phoenix front yards from 2008 to 2018 and from 2018 to 2019. Turnover is high overall, and 1-year change shows many yards with small and a few with large turnover, supporting the importance of both "press" and "pulse"-type changes.

Figure 3. Dissimilarity of woody plant communities at the genus level from four ESCA plots in Phoenix from 2000, 2005, 2010, and 2015 perennial plant surveys.

Figure 4. Dissimilarity for yards that have changed typology (mesic, oasis, xeric, or bare type changes.

Table 1. Summary of Bray-Curtis dissimilarity results for residential yards and ESCA plots from 2000 to 2018.

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Why is turnover so high?
How do people choose what to change?
Are poor plant health and maintenance practices leading to high turnover?
How do these dynamics change with context?

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[References]