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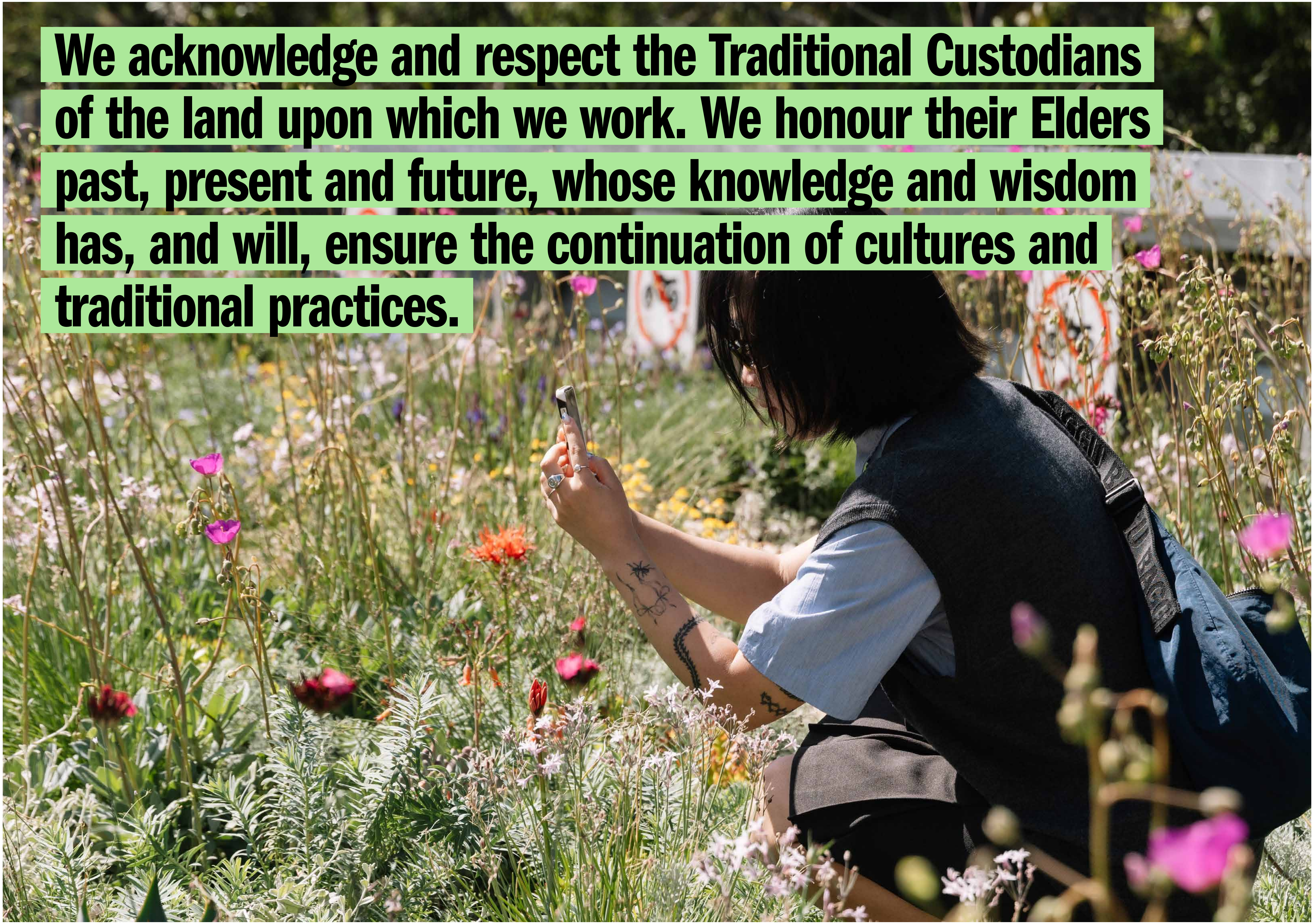
THE UNIVERSITY OF MELBOURNE

UED LAB

WILDLIFE HABITAT DESIGN IN THE PUBLIC REALM

Hassell + University of Melbourne UEDLAB
An education manual to catalyse urban food webs

We acknowledge and respect the Traditional Custodians of the land upon which we work. We honour their Elders past, present and future, whose knowledge and wisdom has, and will, ensure the continuation of cultures and traditional practices.



The content of this document was developed through a Hassell-UEDLAB (UoM) academic-industry partnership. The report is written by Alex Felson and Muniroth Lim with support from Richard Mullane. The graphics are from the UEDLAB and Hassell and unless noted, they were generated by Muniroth Lim during her period as a Research Assistant at the UEDLAB working with Alex Felson, Michael Kearney and Ary Hoffmann for one year from August 2023-2024 and subsequently through her role as a Landscape Researcher at Hassell from March–June 2025.

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OVERVIEW

Urban environments offer abundant opportunities to create high-value habitat patches for native wildlife. Establishing an ecological foundation for urban biodiversity starts with rehabilitating the lower food web, including micro-organisms, insects and other fauna such as springtails, mites, earthworms, and nematodes. These tiny soil inhabitants feed many predators up the food chain while also breaking down organic matter and enriching the soil. These species all depend on carefully crafted and managed habitats to support healthy functional and thriving wildlife in cities.

Landscape architects are already advancing habitat through thoughtful plant selection, attention to soil ecology and the introduction of woody debris. Facing climate change, ecologists are exploring more creative ecosystem rehabilitation measures.

Designers have an opportunity to collaborate with ecologists and expand our practice to include extensive soil rehabilitation and the cultivation of microbial communities that sustain life in the ground layer—where many organisms live.

We can work with ecologists to pursue wildlife translocations to rehabilitate lower food webs and promote biodiversity.

Designers can focus on reintroducing specific functional groups–decomposers, detritivores, pollinators, parasites, predators, and herbivores–to ensure that ecological roles are filled across the breadth of a historically rich habitat.

Soil and ground dwelling fauna lower on the food web are the core focus of WHD-PR as a building block of food webs. We also consider the spatial needs of species that feed on insects including perches, basking areas, water sources, nesting cavities, and protective cover above and below ground.

Focusing on the ground layer and below-ground rhizosphere remains essential for supporting insects and burrowing species, addressing key needs such as nesting, foraging, reproduction, and movement.

In a warming climate, design strategies that introduce habitat and microclimate variation above ground variation–both above and below ground at various depths—can significantly enhance resilience for a wide range of species. These strategies include embedding physical structures, micro-topography, material layering and moisture-retentive soils.

Through a Hassell–University of Melbourne industry–academic partnership, our team is exploring practical design solutions informed by creative research and collaboration with ecologists. By designing public spaces that prioritize fauna lower in the food web, landscape architects and urban ecologists can catalyse broader urban biodiversity. Many birds, reptiles, amphibians, and mammals depend on insects and other soil dwellers for food. This work frames Wildlife Habitat in the Public Realm as a regenerative, educational and climate-adaptive set of strategies within contemporary landscape architecture and urban ecology.

1. Benefits and challenges

Cities are increasingly recognized for their role in supporting biodiversity — even rare or endangered species — and offer unique opportunities to rebuild habitats. With access to materials and funding, designing in the public realm can connect people to biodiversity promoting biophilia. However, these projects also face challenges, such as limited space, human-wildlife conflicts, and the need for ongoing resources for maintenance.

2. Planning for wildlife

Effective habitat design requires smart planning. Geospatial tools should be used to identify habitat patches and corridors, and to define potential wildlife connectivity across the city. Urban typologies — like parks, rooftops, and streetscapes — must be evaluated for their habitat potential. At the site scale, successful habitats are created through targeted interventions, adaptive planting, and phased management over time.

3. Design strategies

Designing habitats in the public realm, requires supporting how species live, eat and nest. Ecologists have traditionally followed a "build it and they will come," model focusing on planting to lure in fauna. Here we present design strategies for enhancing animal foraging and nesting habitats through physical spaces above and below ground. Through careful reintroductions of species lower on the food web, we can boost biodiversity and promote aesthetics and human interaction.

4. Management

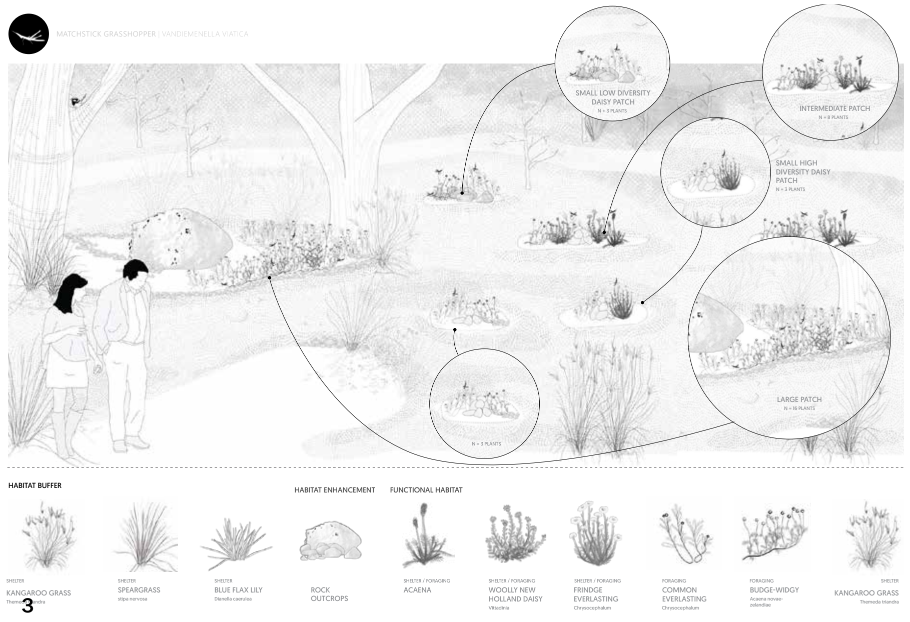
Designed wildlife habitats require consistent maintenance and management to control weeds and invasive species and to monitor the health of the introduced populations over time. Sustainable materials — such as wood, stone, and clay — not only reduce environmental impact but also evolve over time, creating microhabitats for insects, fungi, and other small fauna. With thoughtful management, these spaces become increasingly self-sustaining and resilient.

5. Education

Urban wildlife habitats offer great opportunities for public education. Seeing diverse animal species in everyday spaces can foster curiosity, empathy, and ecological awareness. These designed habitats are living museums showcasing the hidden lives of creatures we share our cities with. Intentional habitat designs adds a curated aesthetic to the public space, similar to public art installations that can communicate stories and data about biodiversity.

1. INTRODUCTION

WHAT IS WILDLIFE HABITAT DESIGN IN THE PUBLIC REALM?



Wildlife Habitat Design in the Public Realm (WHD-PR) is a landscape architecture practice focused on enhancing existing environments or creating new ones—using both organic and inorganic materials—to support the needs of fauna while integrating considerations of safety, maintenance, education, and public interaction.

It includes the provision of buffers, shelter, nesting sites, and foraging areas with access to food and water, alongside seating and observation zones for human users. WHD-PR aims to support species interactions—such as breeding, predation, and community ecology—as well as broader habitat connectivity across urban and peri-urban landscapes.

Images:

1. Song of the Cricket, Venice, Italy (University of Melbourne UEDLAB)
2. MSSI Matchstick Grasshopper Project, Royal Park, Melbourne (UEDLAB + Biosciences)
3. NYC Reforestation Plan (AECOM + YALE University, UEDLAB & Bradford Lab)

BENEFITS WHD-PR

PUBLIC & ECOLOGICAL BENEFITS

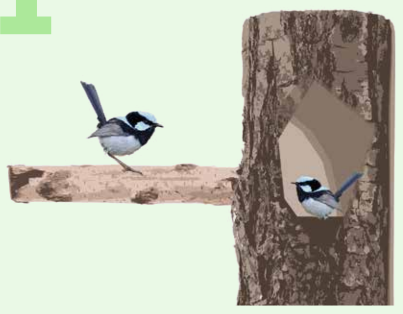
WHD-PR supports people, animals, and plants in a shared space. It creates homes for urban wildlife—like birds, insects, frogs, and lizards—by adding shelter, food, breeding sites and water to parks, gardens, infrastructure or even streets.

Because cities often remove or fragment landscapes, WHD seeks to improve urban biodiversity patches and the connections between them. These designed landscapes attract and support diverse species and keep the environment healthy. By creating habitat corridors, we can connect wildlife patches across the city, giving animals safe paths to travel, find food, and build nests.

These patches don't just help animals—they help people too. They improve urban living conditions by making cities cooler, greener, and more enjoyable to walk and play in.

Finally, WHD can educate the public and share information about biodiversity. Everyone can learn about native animals, plants and soils in the public realm and illustrate how we can care for Country.

1

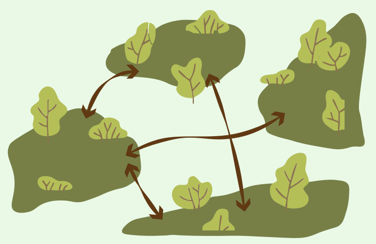


Provide homes for urban wildlife

2

Improve urban patches

3



Connect wildlife patches across the city

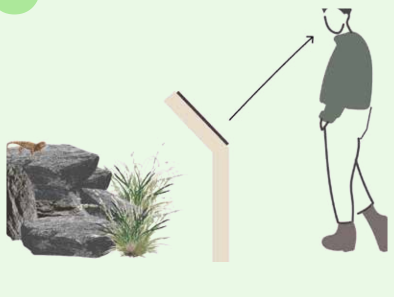
4

Improve urban living conditions

5

Improve urban living conditions

6



Educate and share knowledge

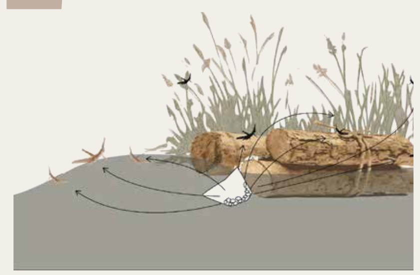
HABITAT STRATEGIES

Each site or specific species may have multiple and diverse opportunities to respond to. Select a combination of goals to assist in Designing Habitat with site specific conditions:

1

Create refugia for nesting & shelter

2

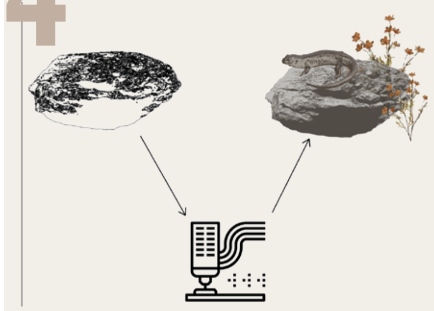


Promote predator-prey interactions

3

Provide food and water

4

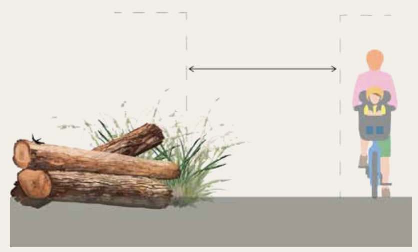


Use data-tools to design

5

Include experiments and monitor

6



Facilitate safe human interaction

CHALLENGES

Establishing wildlife habitat requires care

Alongside the many benefits of WHD-PR, there are also challenges. Many green spaces in cities are small and isolated, which makes it hard for animals to move safely between them. Creating strong wildlife corridors will take time, effort, funding, and support from government policies.

There's also limited space available in cities, and the land that is available often doesn't match species' needs for their territory or survival. Invasive plants and pest species can take over, and food webs—the natural links between animals and what they eat—are often disrupted.

WHD-PR also needs ongoing care and maintenance, but funding is often limited. Sometimes, conflicts happen between people and animals, and not everyone is comfortable having wildlife nearby. Changing public perception and helping people understand and value urban wildlife is an important part of the work.

1. Habitat loss, fragmentation, isolation, low genetic diversity, and small population size

In urban areas, new habitats are often small and separated by roads or buildings, which can isolate wildlife populations, limit movement, reduce genetic diversity, and make it harder for species to survive and grow.

2. Limited resources and gaps in maintenance

Urban habitats require periodic management and care to ensure that plants survive and the availability of food, water, shelter, and safe nesting areas to support wildlife.

3. Human–wildlife conflict

As animals and people share space, conflicts can arise — like animals damaging property or people disturbing sensitive habitats — which can lead to negative outcomes for both.

4. Predation and invasive species

Non-native species and urban predators (like cats) can outcompete or prey on native wildlife, disrupting local ecosystems.

5. Disease and pests

Dense or stressed animal populations are more likely to spread disease, while poorly managed spaces can attract pests that harm both plants and wildlife.

6. Pollution and environmental stressors

Urban habitats face threats from air, water, and soil pollution, as well as noise, light, and heat — all of which can stress or harm wildlife.

Images:

Royal Park Matchstick Grasshopper Designed Experiment
University of Melbourne UEDLAB with Biosciences.
Photo by Alex Felson

FOCUS ON FAUNA

Ecologists and designers often use a "build-it-and-they-will-come" approach when creating wildlife habitats — meaning they plant native vegetation (sometimes with new soil) and expect to attract insects, birds, small mammals and other animals overtime. Also referred to as the "field of dreams" hypothesis, it has been applied in many lightly developed or more natural area restorations. Designers increasingly utilise these methods in urban projects that mix ecological restoration with landscape design.

Places like botanical gardens and urban nature parks show how planting the right species can attract pollinators, birds, and other wildlife, helping to rebuild simple food webs in city spaces. For this document, we focus on improving conditions for animals (Fauna) as well as rebuilding food webs through active capturing and relocating of selected animals (species translocations).

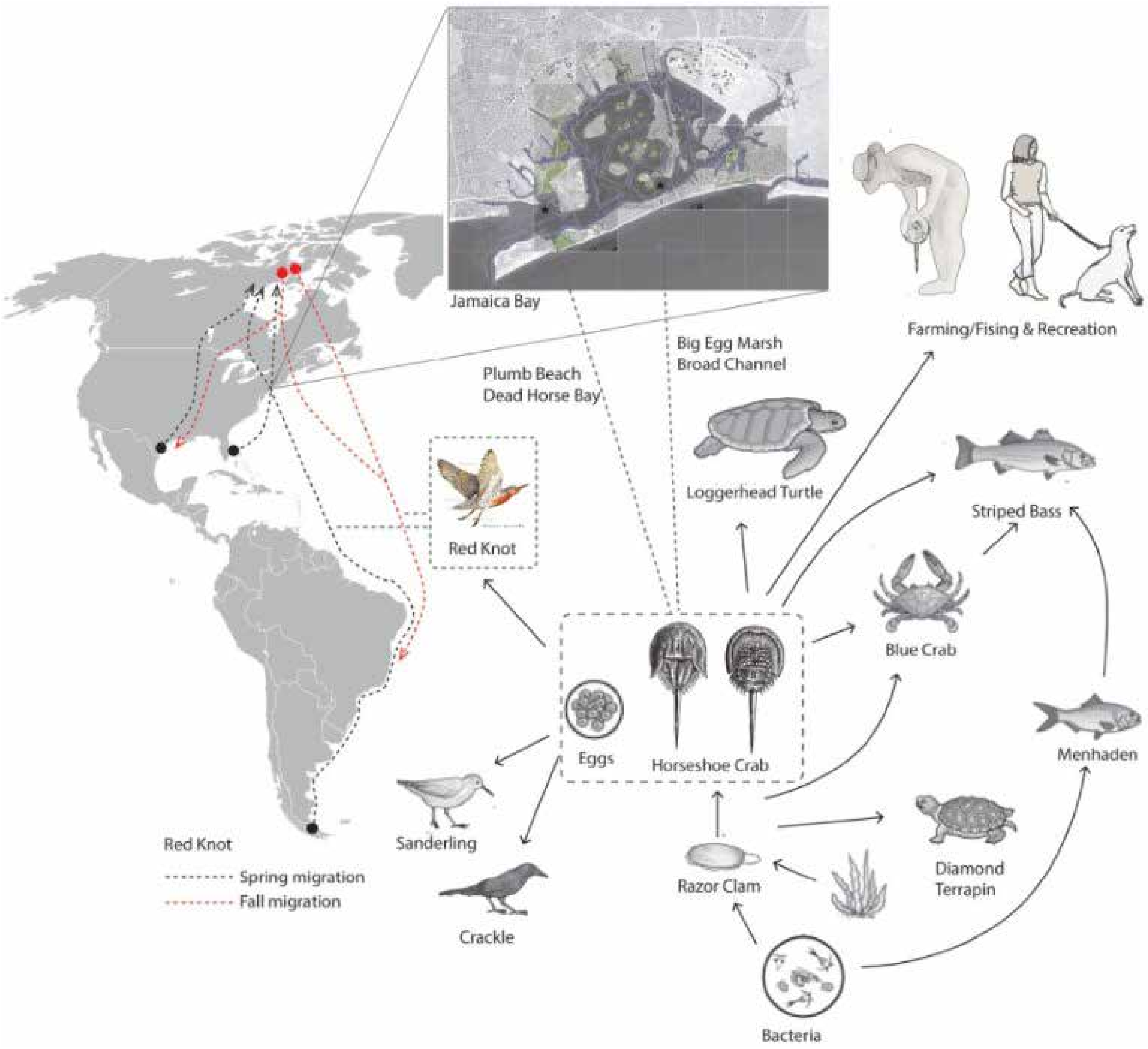


Image:

Jamaica Bay, NY Food web map showing local, continental, and transcontinental linkages with fauna, linked to people across marine and terrestrial species. Image by A. Felson, UEDLAB and used with permission. See Felson AJ and A Ellison. 2021. Designing (for) Urban Food Webs. Frontiers in Ecology and the Environment: 9.

FOCUS ON FOOD WEB REHABILITATION

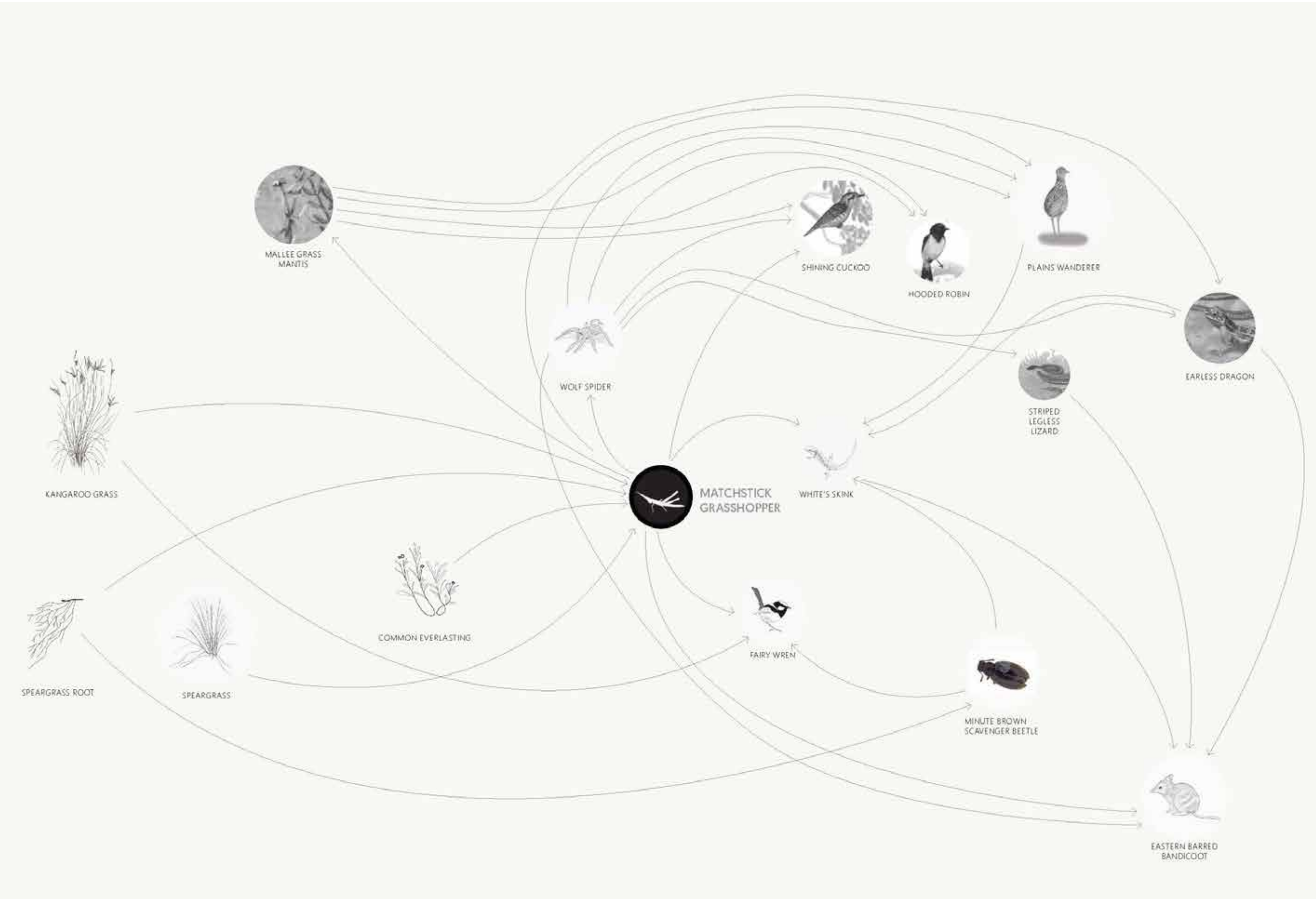
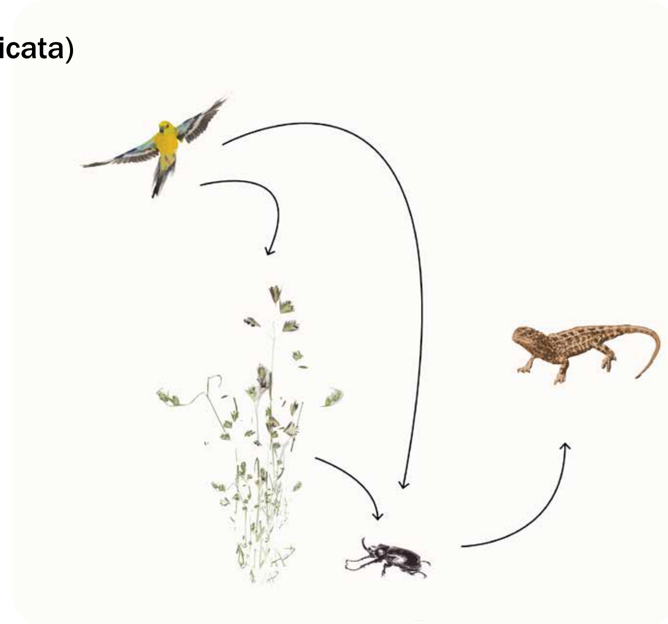


Image:

Royal Park Matchstick Grasshopper Designed Experiment (Vandiemenella viatica). The diagram follows the lifecycle focusing on the seven seasons of the Wurundjeri Woi-wurrung and indicates the food web linkages in relation to the Grasshopper. Used with permission from the UEDLAB, 2024 drawing by Gina Dahl.

1. Small skinks

— white skink (Liopholis whitii)
— weasel skink (Saproscincus mustelinus)
— dark-flecked garden sunskink (Lampropholis delicata)



2. Pollinating insects

— blue-banded bee (Amegilla asserta)
— Sweet bee (Homalictus sphecodoides)

3. Ground-dwelling invertebrates

— order Coleoptera including:
— Lady bugs (Coccinellidae)
— Beetles
— Grasshopper

4. Cultivate lower food web

Using foodweb principle allows us to understand how to attract more species to boost the site biodiversity. If designing habitats for insects create more nesting spaces, it will attract a wider range of fauna looking for food. Other fauna species includes, reptiles birds, owls.

Potential attracted species

Actors in the eco system

Blue-banded bee

Small insectivorous birds

Lizard

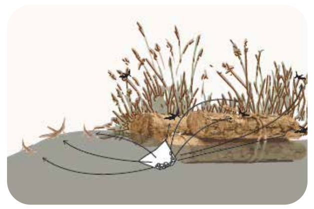
Target group of species for Habitat Design

Solitary ground-nesting bees

Ladybugs (larvae and adult)

Small skinks

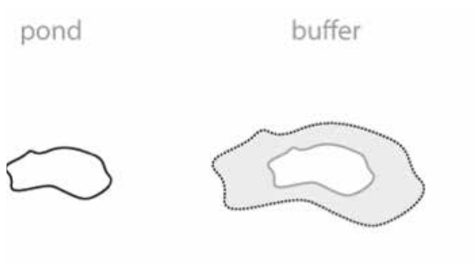
Planting, water source and Habitat Design



2. PLANNING FOR WILDLIFE HABITAT

SPATIAL PLANNING

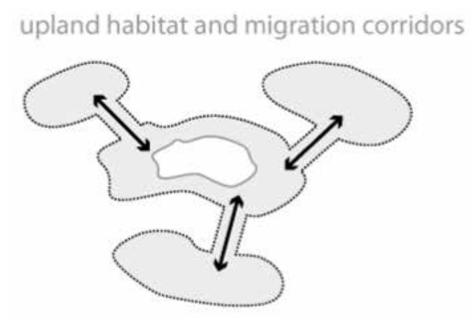
Planning scales for aquatic habitats



Site

PONDS AND BUFFERS

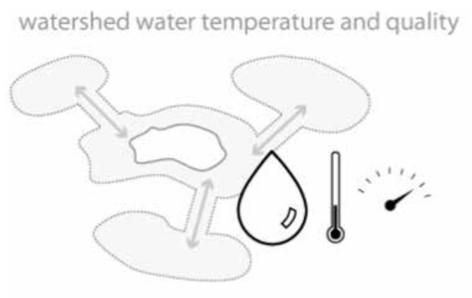
–For aquatic species it is critical to preserve and manage the water body or wetland, including ephermeral wetlands as well as the buffers.



Uplands

UPLAND HABITATS AND MIGRATION CORRIDORS

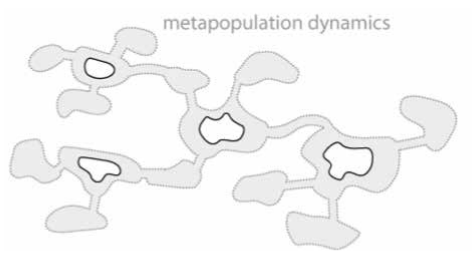
–For aquatic species it is critical to preserve and manage the water body or wetland, including ephermeral wetlands as well as the buffers



Watersheds

WATERSHED AND WATER TEMP. AND QUALITY

–For aquatic species it is critical to preserve and manage the water body or wetland, including ephermeral wetlands as well as the buffers



Metapopulation / networks

ESTABLISHING PATCHES AND NETWORK CONNECTIONS

–For aquatic species it is critical to preserve and manage the water body or wetland, including ephermeral wetlands as well as the buffers

1. Travancore Park
2. Debney's Park
3. Clayton Reserve
4. North Melbourne Recreation Reserve
5. Gardiner Reserve
6. Levers Reserve
7. Princes Park
8. Melbourne Cemetery
9. Melbourne University Sports Ground
10. Melbourne University Campus
11. University High School Sports Grounds
12. Errot St Reserve
13. Inner City Circular Park
14. Melbourne Cemetery
15. Melbourne University Sports Ground
16. Melbourne University Campus
17. University High School Sports Grounds
18. Linear Park Reserve

Image:

Scales not addressed through the regulations. Tuxedo Farms amphibian migration and larval density designed experiment, Tuxedo, NY. Built 2006-2008. ASLA New Jersey Chapter, Merit Award, 2007. Collaboration across Related Company, EDAW / AECOM & Rutgers University, Alex Felson (diagrams by Timothy Terway).

Image:

Royal Park Plan prepared by the UEDLAB for the Matchstick Grasshopper Designed Experiments project, focusing on spatial planning and connectivity. Used by permission from the UEDLAB.

URBAN TYPOLOGIES

Plazas, squares, parks and gardens

Characteristics

- → Majority covered in hardscape material, lack of bare ground, constant movement and traffic, lack of greenery, noise and light pollution, lack tree canopy

Opportunities

- → Re-vegetation with tree canopy and medium heigh shrubs, visually attractive designed habitats, educate and promote urban biodiversity research in a high traffic environment

Examples

- → Town hall, square, plaza, school yard, university space

Building rooftops and walls

Characteristics

- → Abundance of tree canopy, different height of vegetation, invasive weed, abundance of plants, lack of shelter from predators

Opportunities

- → Use natural materials found on site to construct habitat, nesting space to increase population

Examples

- → Park, garden, forest, meadow, grassland

Streetscapes and railroad corridors

Characteristics

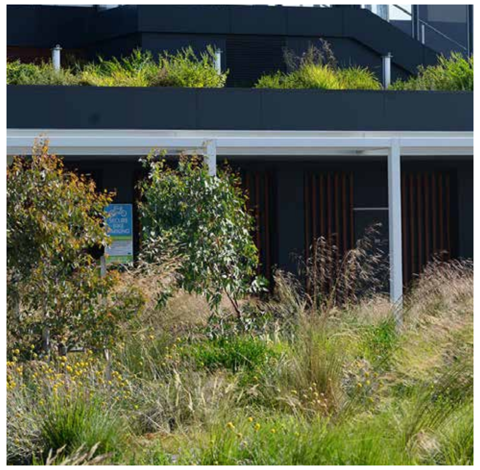
- → Organised planting, young trees, low to medium tree canopy, mix of different vegetation height, movement

Opportunities

- → Hollow tree, habitat design on tree

Examples

- → Streetscape, laneways, roads



Public infrastructure

Characteristics

- → Organised planting, young trees, disturbed or fragmented habitat, noise pollution, vibration disturbance

Opportunities

- → Use natural materials found on site to construct habitat, nesting space to increase population, habitat design as land art installation

Examples

- → Metro station, regional railways station, train station, airport

Riparian buffers and remnant landscapes

Characteristics

- → Sensitive ecological areas often located along water bodies or on sloped terrain that are prone to erosion and sedimentation where vegetation is removed. Riparian areas commonly have local restrictions or protections. Steep slopes are often left undeveloped but may be degraded or invaded by non-native species.

Opportunities

- → Can act as corridors for wildlife movement for pollinators, birds, and small mammals. Can also filter runoff, improving water quality, and supporting aquatic life.

Examples

- → Creek edges, riverbanks, stormwater infrastructure, ravines, hillsides, sloped parklands

Private property

Characteristics

- → Ownership limits coordinated planning, property scales can vary but are often homogenous within neighbourhoods. Land uses and zoning can impact the land uses and organisation. There is a predominance of lawns, ornamental species, or impermeable surfaces and a lack of native vegetation. Pesticide use, fencing, and pet-related disturbances are also concerns.

Opportunities

- → Represents a large portion of urban land. Investment options for landscape management. Encourage community stewardship and strategic private land retrofits supporting biodiversity and green infrastructure goals. Incentivise native plantings, pollinator gardens, rain gardens, and habitat-friendly landscaping. Reduce pesticides, allow leaf litter, install bird boxes.

Examples

- → Backyards, front gardens, apartment complexes, commercial landscaping, corporate campuses

SITE SCALE HABITAT DESIGN

Nursery populations

Characteristics

→ Areas where specific plant or animal species are cultivated or supported to aid in population recovery, habitat restoration, or ecological resilience. These may be managed or semi-natural environments designed to promote early-stage growth and establishment.

Opportunities

→ Support biodiversity and genetic diversity by bolstering threatened or declining populations. Serve as source populations for larger restoration efforts. Can engage the public through educational programs or citizen science.

Examples

→ Native plant nurseries, amphibian breeding ponds, seed banks, bird nesting areas.

Royal Park Direct Seeding Project, CoM and UoM Katherine Horsfall and Nicholas Williams

Island patches

Characteristics

→ Small, often isolated areas of habitat that support native flora and fauna within an urban or fragmented landscape. Their ecological value depends on size, quality, and proximity to other habitats.

Opportunities

→ Serve as stepping stones for wildlife movement and increase overall habitat connectivity. Provide refuge for species in urbanized or developed areas. Can be integrated into parks, campuses, and roadside plantings.

Examples

→ Native plant meadows, urban woodlots, wetland remnants, rooftop gardens.

Royal Park plantings. Photo by Alex Felson

Habitat corridors

Characteristics

→ Linear features or zones that connect separate patches of habitat, facilitating movement and genetic exchange between wildlife populations. Can be natural or designed and vary in width and formality.

Opportunities

→ Promote biodiversity by reducing habitat fragmentation. Enable migration, breeding, and dispersal of species. Can double as recreational or educational greenways in human-dominated areas.

Examples

→ Greenways, stream buffers, rail-to-trail conversions, hedgerows, highway underpasses with native planting.

Grassland Planting

Designed experiments

Characteristics

→ Purpose-built and designed experimental installations or interventions that test ecological assumptions, restoration methods, or design strategies in real-world conditions. These may involve controlled variables and long-term monitoring.

Opportunities

→ Advance scientific understanding while generating on-the-ground impact. Exploring an experimental aesthetic. Engage students, researchers, and the public. Results can inform future design, management and policy decisions.

Examples

→ Pollinator garden trials, soil remediation plots, water retention prototypes, climate-adaptive planting studies.

Deer Park Station, Melbourne (Hassell)

WILDLIFE TARGETS

Urban environments are home to a variety of tiny but critical organisms—like springtails, mites, and earthworms—that perform key roles in the ecosystem. Functionally, these soil dwellers act as detritivores, predators, and even parasites, all contributing to decomposition, nutrient cycling, and pest control. When considered alongside pollinators and herbivores, they form the foundation of a functioning urban food web and support a variety of other animals including birtds, reptiles and small mammals who predate on these smaller organisms.

Ground dwelling insects and invertebrates

Habitat needs

- → sun exposure for basking
- → preference of North facing sun
- → water presence
- → bare ground
- → hiding spots
- → rocks to warm up
- → preference of native grasses and plants
- → shaded area during hot afternoon sun

Behaviour

- → foraging
- → basking
- → burrow around 10-20cm
- → underground

Nesting

- → nesting near ground
- → or below ground
- → Habitat needs:
- → vegetation (native preference)

Aerial predator

Anisoptera

Soil-dwelling predators

Calosoma schayeri

Pollinator

Amegilla cingulata

Herbivore

Keyacris scurra

Parasite

Meloidogyne enterolobii

Detritivore

Isopod

Urban reptiles are one example of an essential actors that are being explored for reintroductions and rehabilitation. Establishing these populations will boost biodiversity in cities providing a more diverse range of species. They also act as natural pest control of insect population to reduce spread of diseases, as well as prevent damage to buildings.

Reptiles (lizards, skinks)

Habitat needs

- → sun exposure for basking
- → near grasses for foraging
- → rocky habitats
- → nooks and crannies between rocks
- → shaded areas
- → complex tunnels

Behaviour

- → foraging
- → basking
- → burrow complex tunnels

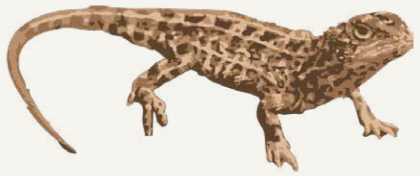
Nesting

- → nesting in moist soil
- → or under foliage structure

Diet

- → small insects and plants

Liopholis whitii



Tympanocryptis pinguicolla

3. WILDLIFE HABITAT DESIGN

SPATIAL CONFIGURATION

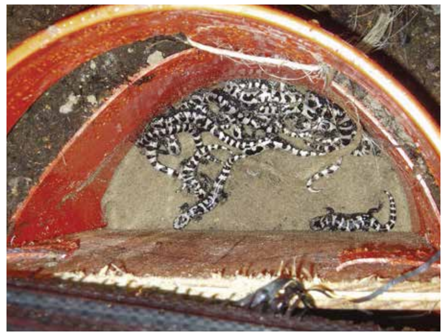
Habitat configuration and arrangement

In urban environments, the spatial arrangement of habitats directly influences ecological function and species persistence.

Rather than treating habitats as isolated elements, they should be designed as part of a broader meta-network that supports movement, genetic exchange, and adaptation.

Different configurations offer distinct ecological benefits: singular or sparse placements may suit nesting for existing site-specific species, while linear arrangements help reconnect fragmented habitats to form larger, continuous zones.

Clustering habitats creates concentrated resource areas that encourage exploration and colonisation by new fauna. Together, these varied strategies provide critical refugia and promote biodiversity within complex urban matrices.



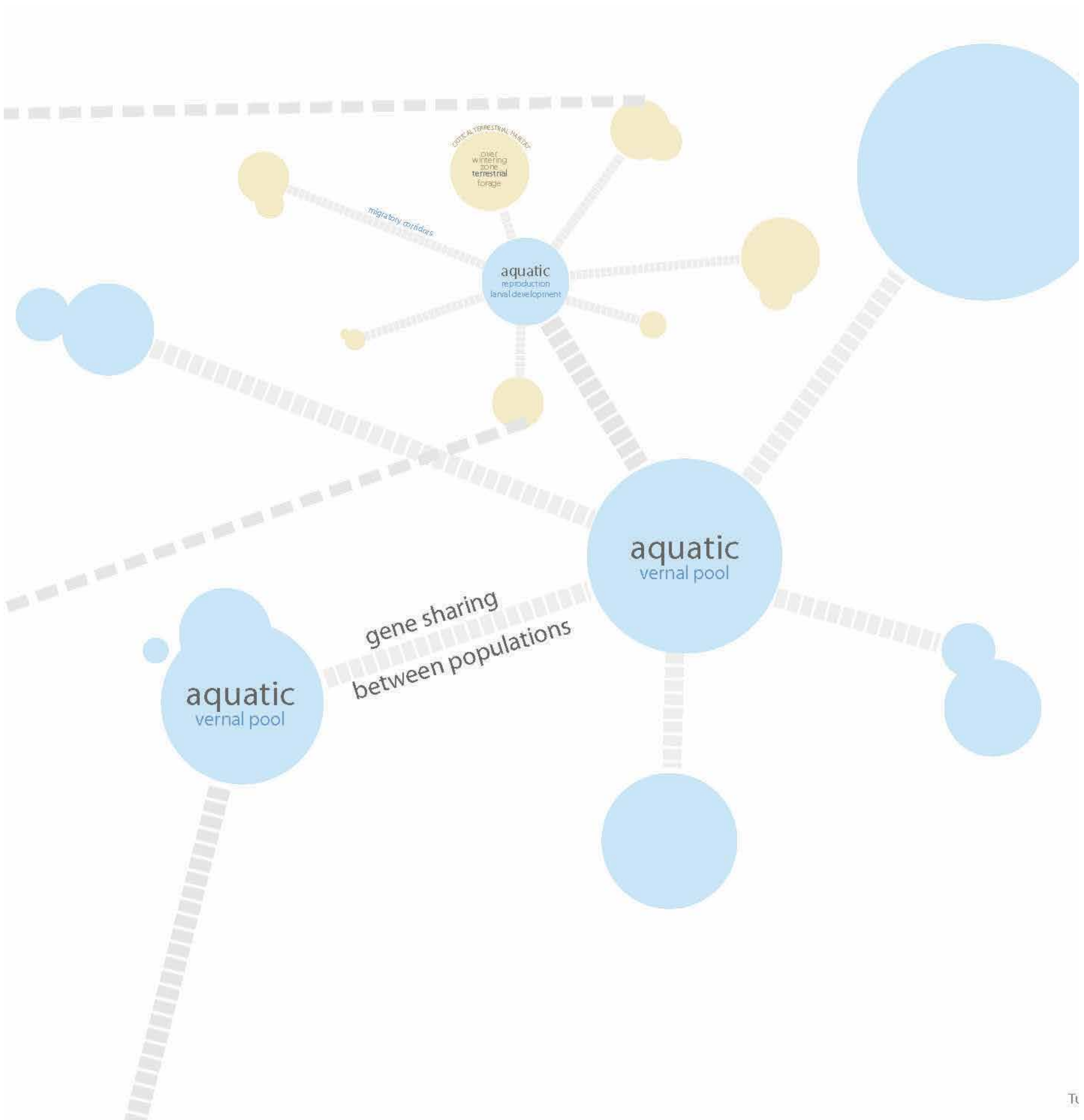


Image:

Tuxedo Farms metapopulation dynamics diagram.
EDAW / AECOM drawing by Alex Felson and Timothy Terway.

EARTHWORK & GRADING

Above and below ground physical dimensions for habitat construction

Earthwork and grading are foundational tools in habitat-oriented landscape architecture, shaping the land to support hydrology, microclimates, and ecological function.

By manipulating physical dimensions—such as slope, depth, and contour—designers can create a variety of microhabitats that support different species and ecological processes.

Vertical gradients, from mounded berms to shallow depressions, influence moisture retention, solar exposure, and drainage patterns, which in turn affect vegetation types, soil organisms, and wildlife use.

Gradual transitions in elevation can support species movement and enhance connectivity, while steeper features may offer refuge, nesting, or basking sites.

Thoughtful grading supports both ecological performance and visual complexity, enabling multifunctional landscapes that evolve over time.

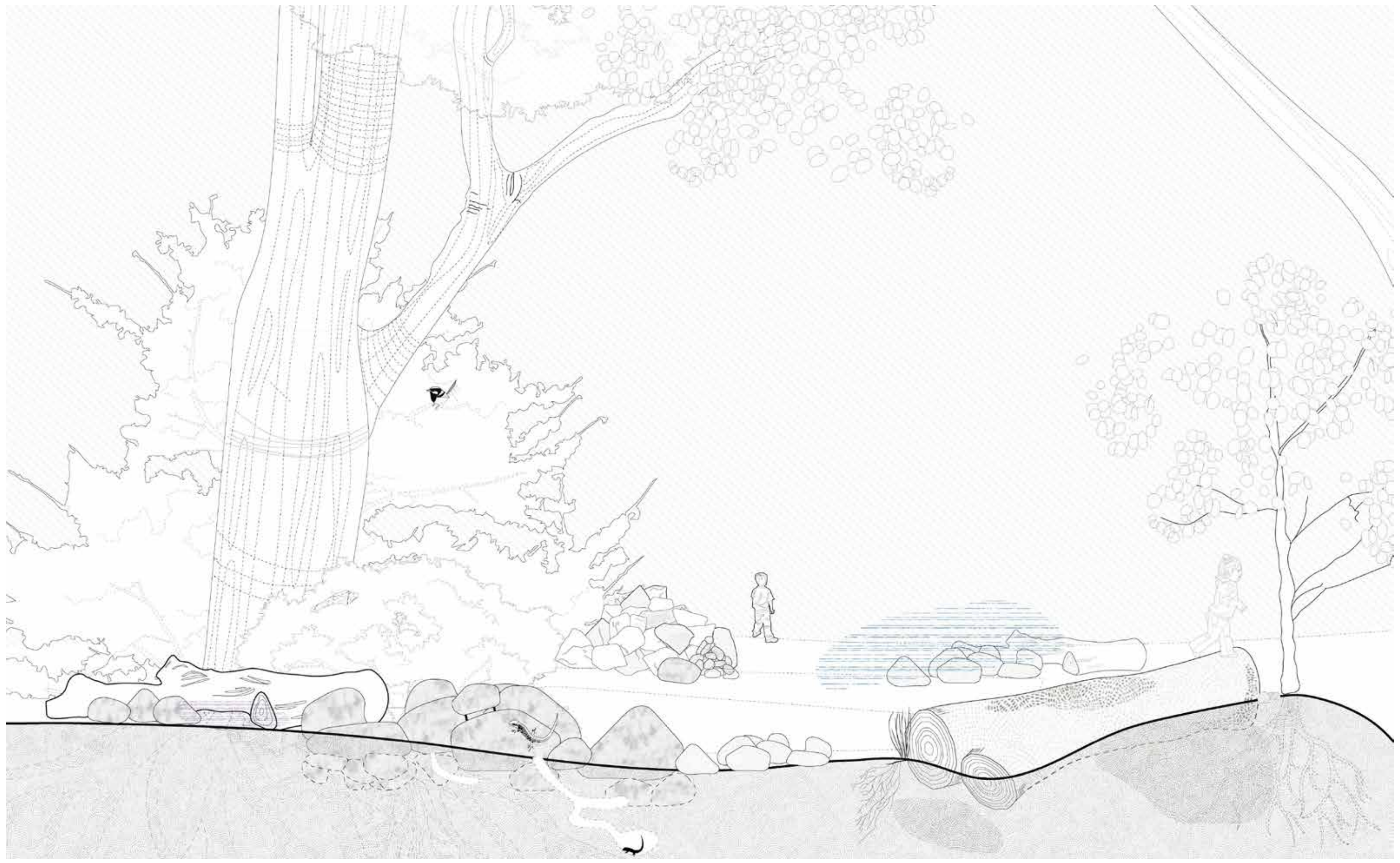
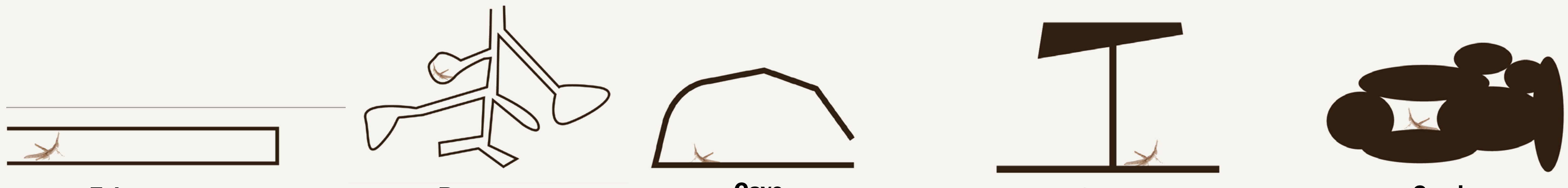


Image:

Royal Park Matchstick Grasshopper Designed Experiment. Used with permission from the UEDLAB, Drawing by Gina Dahl.



PLANTING DESIGN

Vegetation layout, density and composition

Planting design plays a critical role in shaping ecological function and spatial experience within the landscape.

Approaches may range from geometric, formal arrangements to more naturalistic compositions, each serving different aesthetic and functional goals.

Strategic variation in planting density—such as dense thickets for habitat or bare ground for egg laying or for human access—can support both ecological and social needs.

Establishing plant diversity across species, structure, and seasonal expression enhances resilience, fosters species interactions, and supports a wider range of fauna.

Thoughtful layering and spatial configuration of plants contribute to microclimate regulation, soil health, and long-term ecosystem performance.

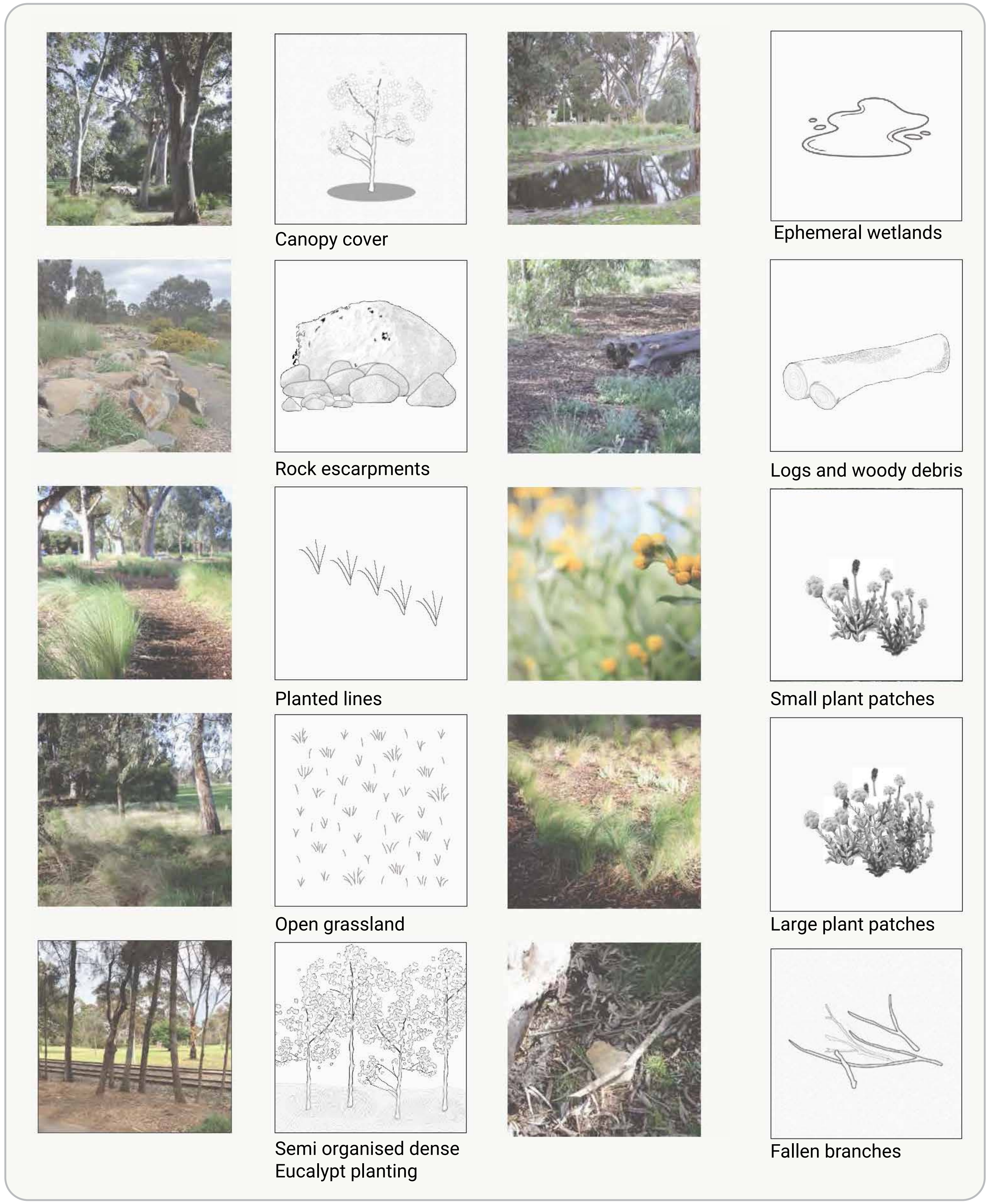


Image:

Royal Park Matchstick Grasshopper Designed Experiment. Plant configuration studies. Used with permission from the UEDLAB, Drawing by Gina Dahl

HUMAN INTERACTION

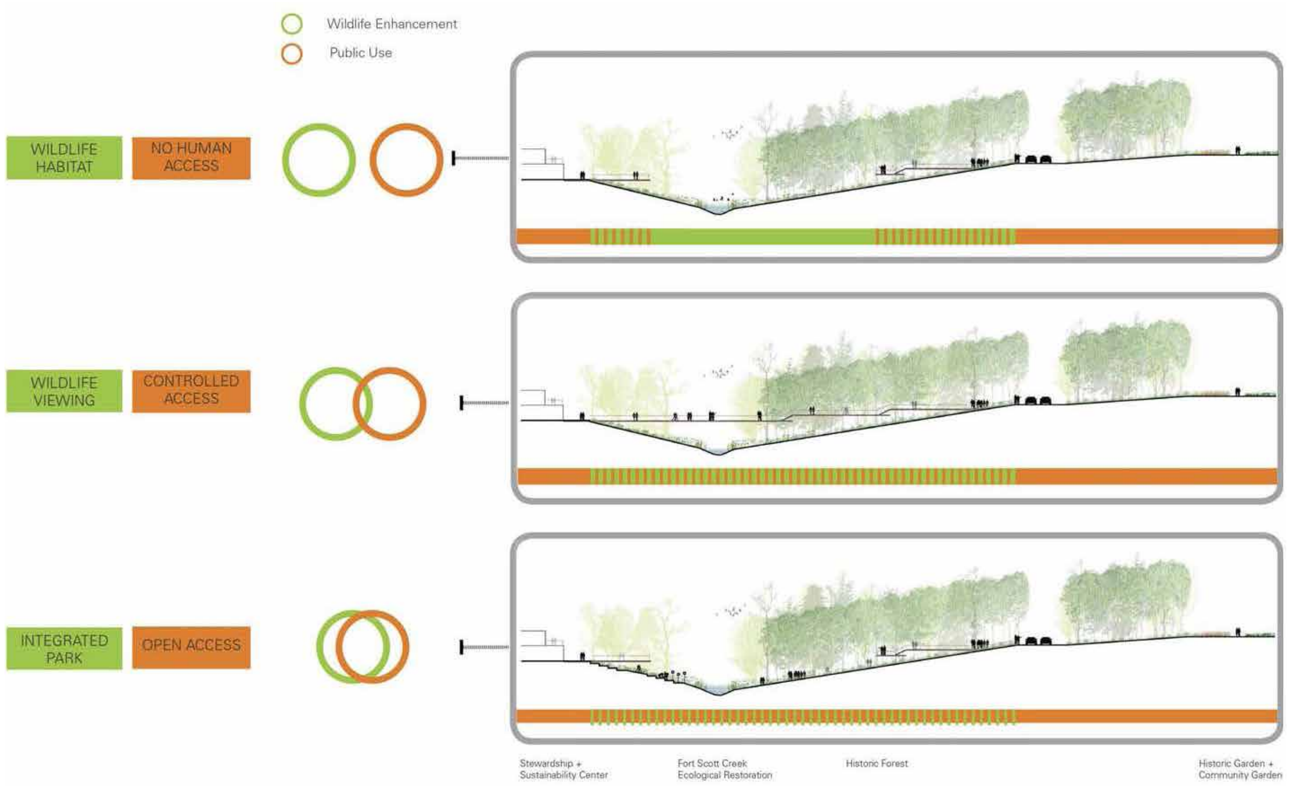
Promoting postive human-nature experiences

The degree of public interaction with designed habitats should be thoughtfully calibrated to support both ecological and educational goals.

Where the priority is species protection or population growth, low-interference strategies—such as enclosed, screened, or partially buried habitats—can minimise disturbance.

Conversely, where the aim is public engagement or environmental education, more visible, accessible, and aesthetically inviting habitats are appropriate.

Ideally, urban sites should offer a range of habitat types with varying levels of interaction, allowing for both quiet refuge and opportunities to connect, observe, and learn from biodiverse systems.



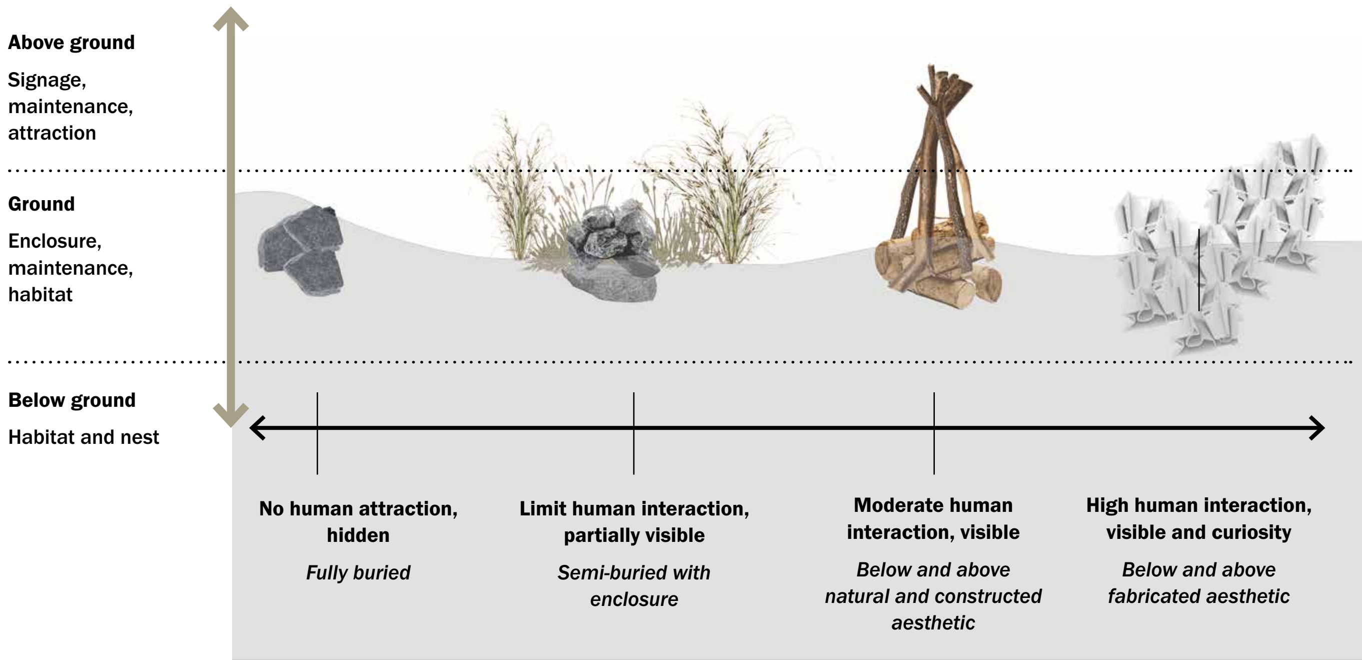
Presidio Fort Scott Creek + Historic Garden
2008 NY ASLA Awards

Sections: These sections illustrate alternative scenarios balancing wildlife habitat value with public access and use.

EDAW | AECOM, Drawings by Alex Felson

Image:

Photo of Royal Park by Alex Felson



MATERIALITY

Materiality in urban ecology

Material selection in landscape architecture plays a crucial role in shaping both the ecological function and experiential quality of urban habitats.

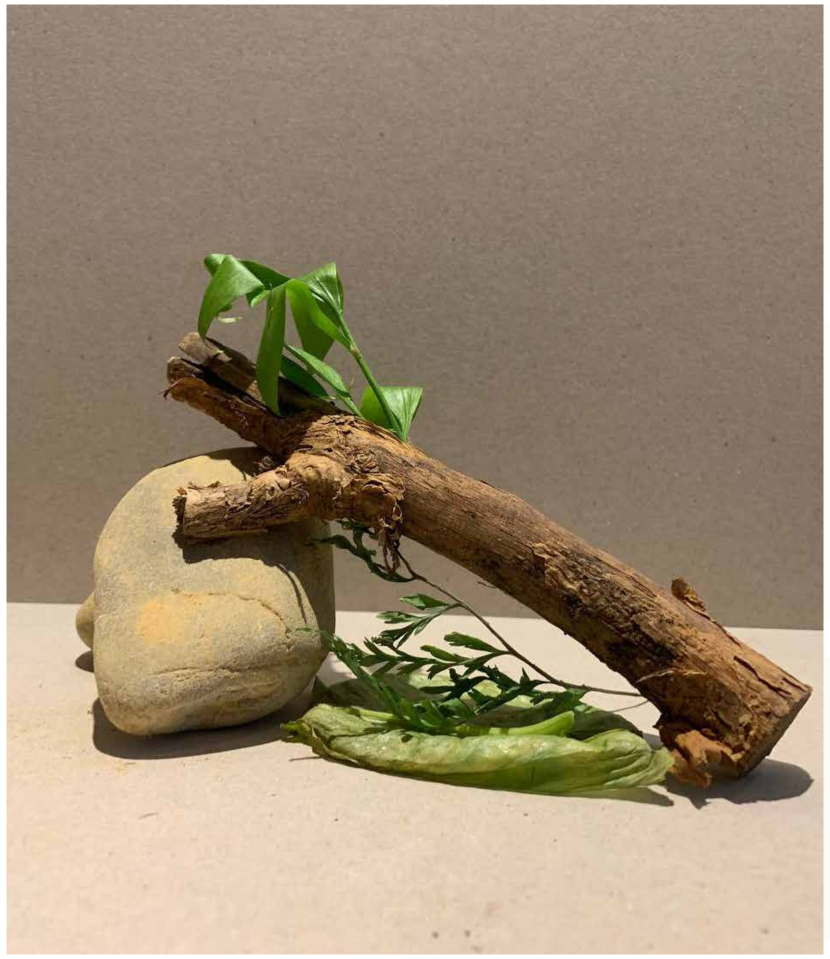
A careful integration of biological and human-made materials can enhance habitat performance, longevity, and public engagement. Natural materials—such as timber, stone, and soil—often support decay, nutrient cycling, and microhabitat creation, while also offering a more organic aesthetic.

In contrast, fabricated materials like concrete, metal, or 3D-printed composites can provide structural durability, precision, and visibility in high-use or exposed areas.

The choice of materials should consider endurance under urban conditions, integration with planting and hydrology, tactile experience, and opportunities for ecological interaction. Ultimately, materiality should support long-term performance while communicating the habitat's purpose to both wildlife and people.

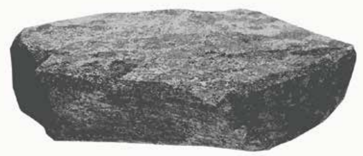
Fredi Schelb, 2023

Karin van der molen. (2013). Stop Motion. http://karinvandermolen.nl/?fluxus_portfolio=stop-motion



Wood, log, timber, branch
Provide food resource, protection and space to colonise

Clay material, clay brick
Serve as a thermal mass, enhancing the habitat's micro climate



Rock, granite, stone, offers crevices, nooks and crannies when combined together

1
NATURAL
Stacking, hanging, assembling, burying

2
CONSTRUCTED
Drilling, cutting, organic shape

3
FABRICATED
3D printing, pattern

AESTHETICS

The aesthetics of designed habitats can range from raw and naturalistic to highly engineered and expressive, depending on material choices, construction methods, and intended public interaction. Some habitats may use simple, stacked materials or drilled cavities that mimic natural forms, blending subtly into the landscape.

At the other end of the spectrum, digitally modelled and 3D-printed structures allow for complex geometries and surface patterns that draw attention and support specific ecological functions.

Aesthetic choices should align with both ecological performance and public engagement goals—whether to quietly integrate into the environment or to serve as visible, educational installations that spark curiosity and dialogue.

Construction efficiency and cost are drivers to consider alongside legibility, endurance and other key variables in an urban context. Designed habitat can even be modelled and 3D printed, creating pattern and complex structure not easily produced with manual force.

100 Acres of Poison Ivy Transformed. https://www.nytimes.com/slideshow/2013/12/19/garden/20131219-GARDEN/s/20131219-GARDEN-slide-360Q.html?ref=garden

Broughton grange, UK
https://www.flickr.com/photos/16497759@N07/7668862696/in/photolist-cFEVGC-bvtMVK-qAUFEx-pE5Jkf-qKP6ZX-qyNeRY-unqZkN-9Kp85c-bKxeWe-9KrZAC-eeiTdD-bA2jWH-bn7sUj-qjEiRcbvsDY8-qKPckr-bvtNbt-bvtJ1V-dmXMk8-9KrXwq-bvszDF-bvtRVV-rgTWA4-bKxerB-bvsDEr-bKxySZ-b

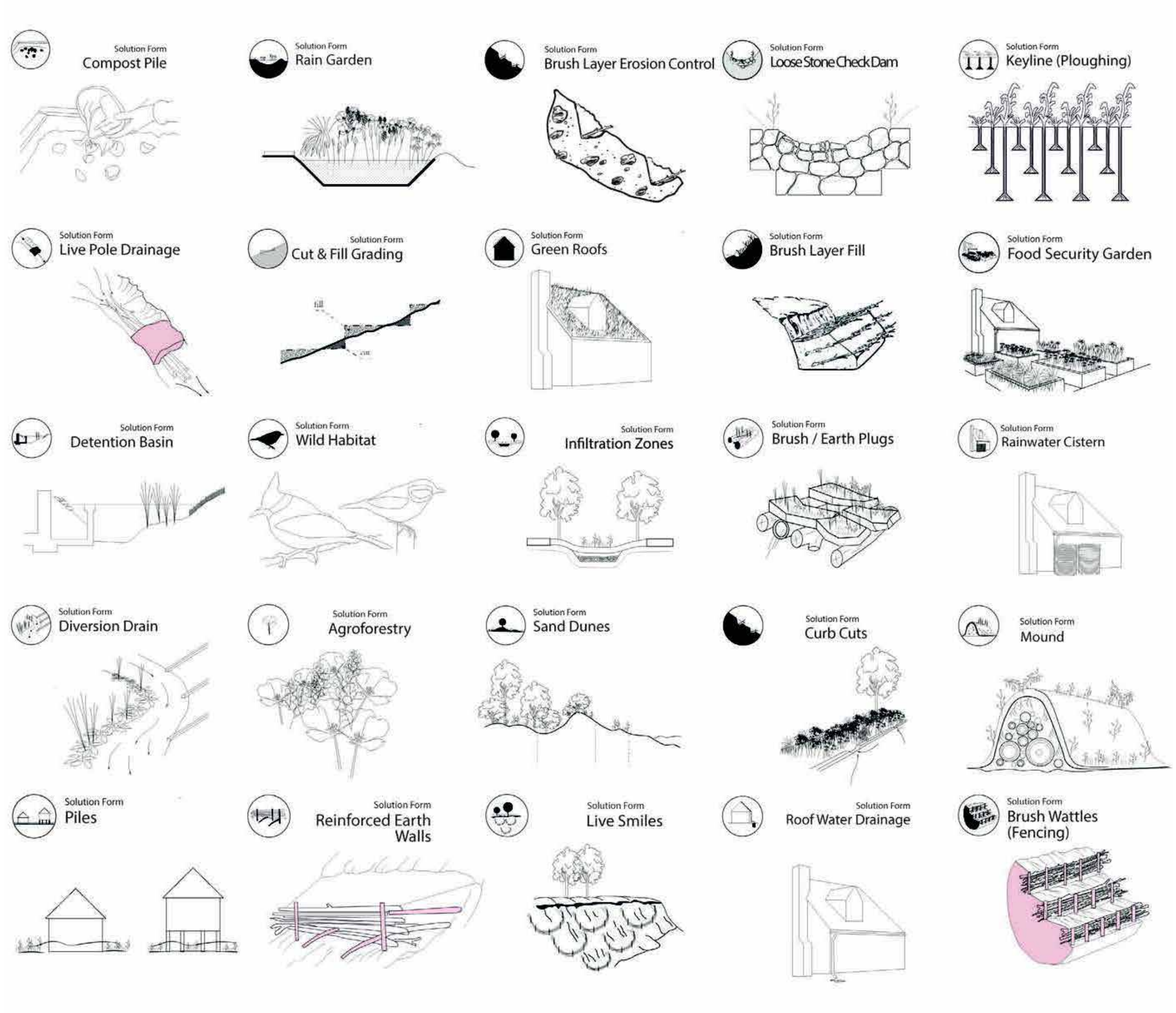


Image:

The People's Plan for Resilient by Design in Marin County, California. Shows a series of landscape treatments designed for aesthetics and function and to be selected by the community for inclusion in the design by the Permaculture + Social Equity Team. Drawing is provided by permission from the UEDLAB by Samantha Monge Kaiser

4. MANAGEMENT

MANAGE FOR BIODIVERSITY

Management and maintenance are critical for the success of WHD-PR. At the outset of a project, it is essential to develop a comprehensive assessment of the existing regenerative habitats and ecological processes within the focus area to establish a baseline understanding of current conditions. Based on this, the designer and researcher should identify specific opportunities for the enhancement and restoration of ecologically rich habitats, with attention to biodiversity, connectivity, and ecological function.

Based on this assessment, the design team should generate an actionable plan that outlines targeted strategies to improve the ecological health of the designated areas. This plan should include recommendations for sustainable land management practices such as habitat restoration, soil enrichment, and water resource management.

The project should include a detailed proposal for improvements along with their anticipated ecological benefits, forming a roadmap for long-term stewardship and adaptive management.

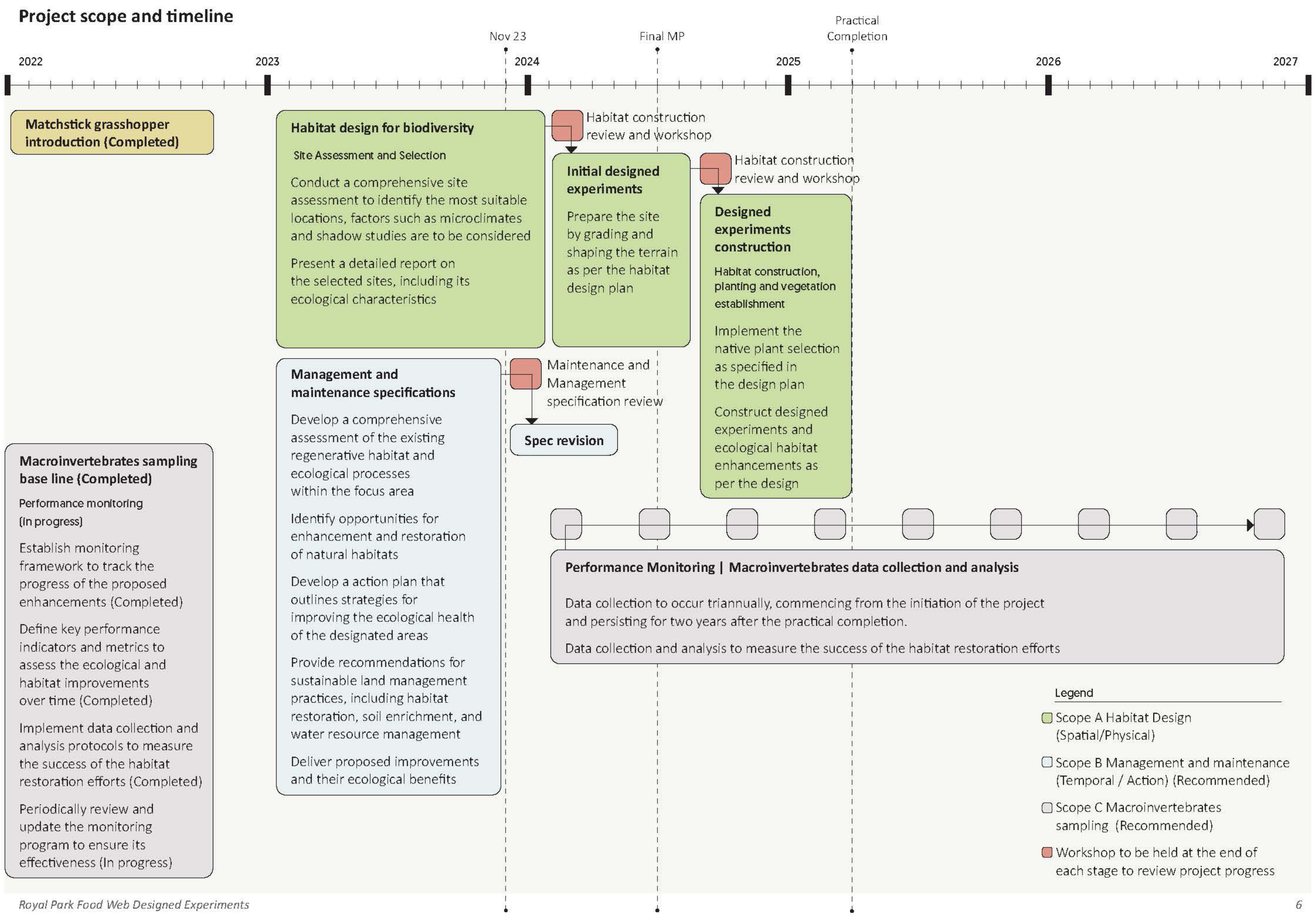


Image:

Royal Park Matchstick Grasshopper Designed Experiment. Schedule for the sampling, design, site assessment, implementation and monitoring. Used with permission from the UEDLAB.

MANAGE LIFECYCLES OVER SEASONS

Effective habitat design and stewardship must account not only for spatial considerations, but also for seasonal variation and the dynamic lifecycles of the organisms being cultivated. Management pratices need to align with species' seasonal patterns, reproductive cycles, migration periods, and ecological interactions.

Maintenance schedules and public access must be carefully planned to avoid disturbance during sensitive times, such as nesting, breeding, or larval development. Special attention should be given to overlapping needs between species—such as shared foraging grounds or predator-prey relationships—to support functional ecological dynamics.

Designers and land managers are encouraged to organise their management strategies around the Wurundjeri Woi-wurrung seasons and to integrate phenological calendars and ecological monitoring into long-term planning to adaptively manage Country.

By aligning human activity with biological rhythms, we can not only support the persistence of key species but also foster public understanding of biodiversity and interspecies relationships across seasons and years.

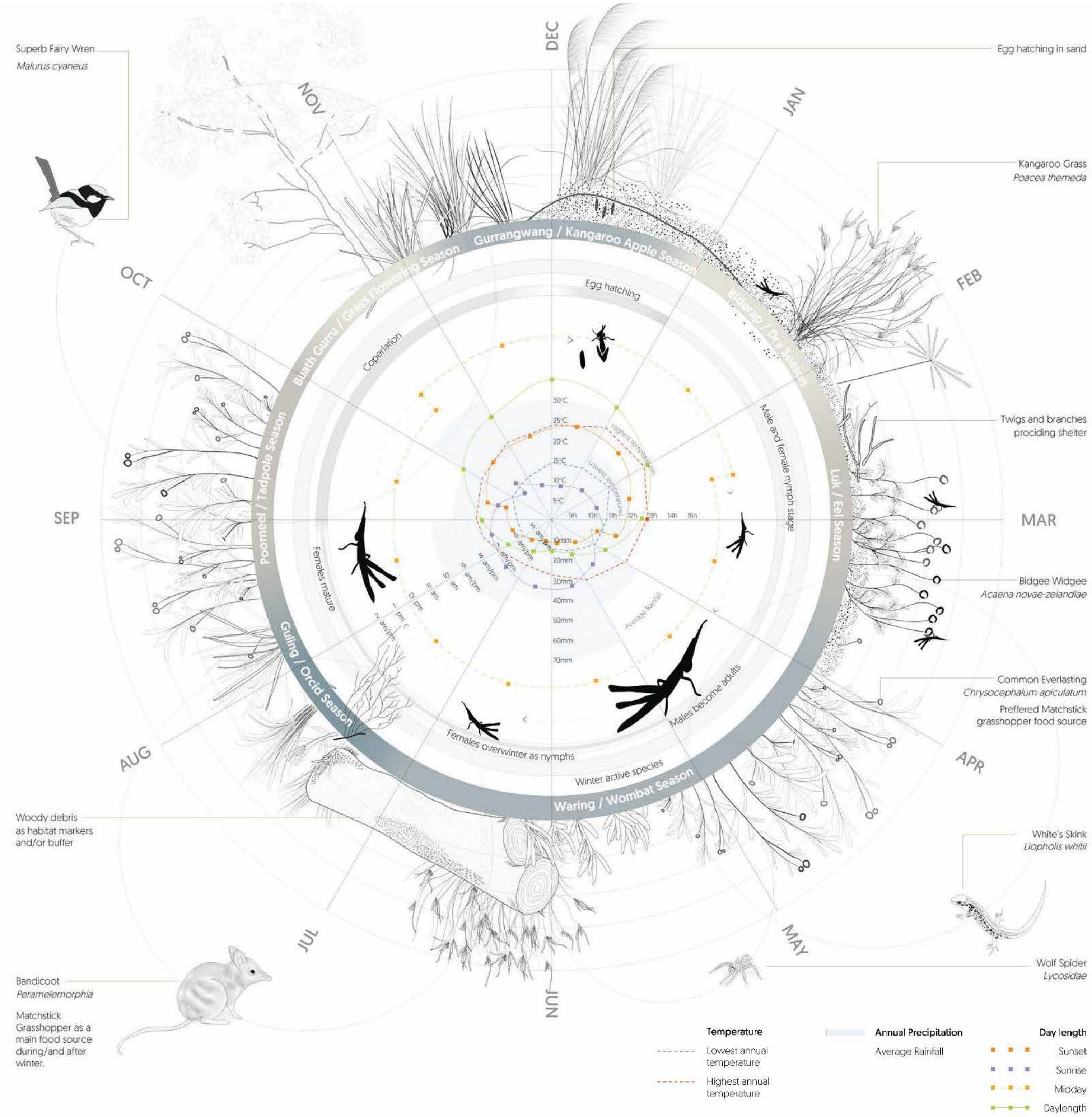


Image:

Royal Park Matchstick Grasshopper Designed Experiment (Vandiemenella viatica). The diagram follows the lifecycle focusing on the seven seasons of the Wurundjeri Woi-wurrung and indicates the food web linkages in relation to the Grasshopper. Used with permission from the UEDLAB, 2024 drawing by Gina Dahl.

5. DESIGN EDUCATION

URBAN RESEARCH AND EDUCATION

Multiple examples exist of established research projects with embedded designed experiments intended for testing, evlauation and education. The Federation Square – Laak Boorndap Test Garden, offers a preview of the forthcoming urban garden that will anchor the Melbourne Arts Precinct.

The Test Garden builds on the long history of experimentation that has occured at Royal Park where vegetation studies alongside other research have informed the park design, maintenance and management over time.

This research approach illustrate strategies for urban biodiversity education and conservation: one delivering a designed experimental method embedding research-driven landscape architecture that showcases climate-adapted planting and ecological programming with active community involvement.

	Regeneration Projects	Year	Action	Collaboration
1	Australian Native Garden Pond	1970		Grace Fraser in the 1970s
2	Trin Warren Tam-boore wetland	2006-2010	WSUD	
3	Royal Park West Skink Site	2013	Management plan	CoM / Melbourne Water
4	Royal Park Stormwater Harvesting Project	2013	WSUD	Green infrastructure research group
5	The Woody Meadow Project	2015-2020		CoM / RPPG
6	Royal Park West Remnant Vegetation Site	2017	Community planting	CoM / RPPG
7	Grasslands planting at Bayles Street	2017	Community planting	CoM / Spiire
8	Elliot Avenue Billabong	2017	Revitalisation project	RPPG
9	Remnant Protection	2018	Signage	RPPG
10	Water Sensitive Urban Design Coordinator	2019		Adam Bandt's office, RPPG
11	Bren's Remnant Native Vegetation Area	2019	Nature in the City strategy	Unimelb, Urban Forest & Ecology Team, CoM
12	Royal Park Direct Seeding Project	2018 - 2022	Native grassy understorey	UniMelb, CoM
13	Superb City Wrens Project	2020 - 2022	Superb Fairy Wren Habitat	CoM, BirdLife Australia, RMIT, UniMelb

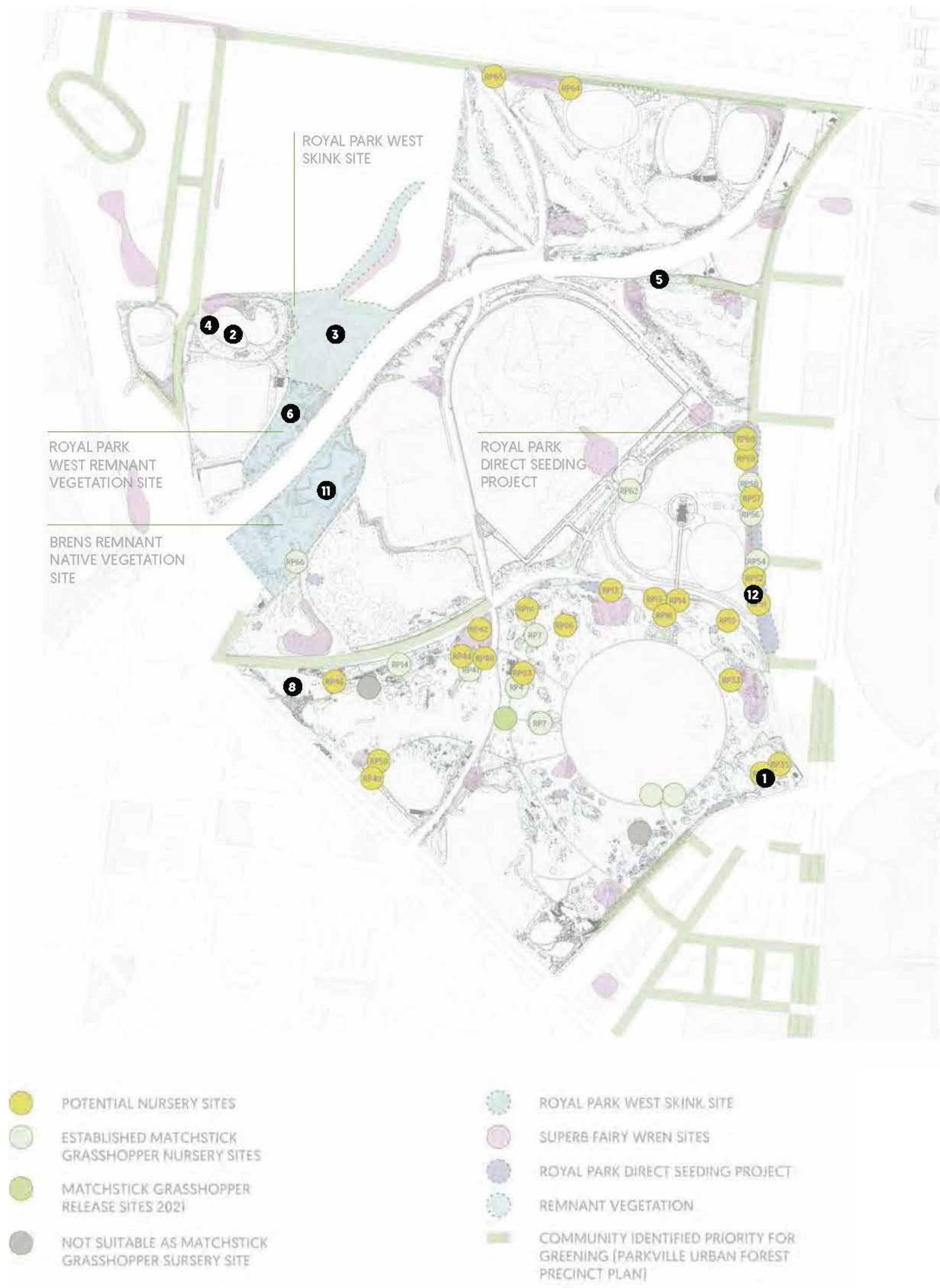


Image:

Royal Park showing existing research sites with staff from the UoM and proposed sites for the Matchstick Grasshopper, used with permission from the UEDLAB. Drawing by Gina Dahl.

CO-GENERATION AS AN EDUCATION APPROACH

Ecological education benefits from collaboration with the local community.

Working with communities to generate collaborative design tools that allow community members to learn about place making and to understand how to combine selected practices in targeted locations with specific configurations is critical.

The tool on the right builds on the perma-culture design system based on indigenous knowledge and wisdom that elevates ecosys-tem health while meeting human needs.

The simplified basemap represents the context of the land and community that lives there. It is an easily readable and understandable map and includes existing built elements such as streets, homes, parking lots, buildings, etc.

It also includes watershed features, contour and any major above ground civic water infra-structure.

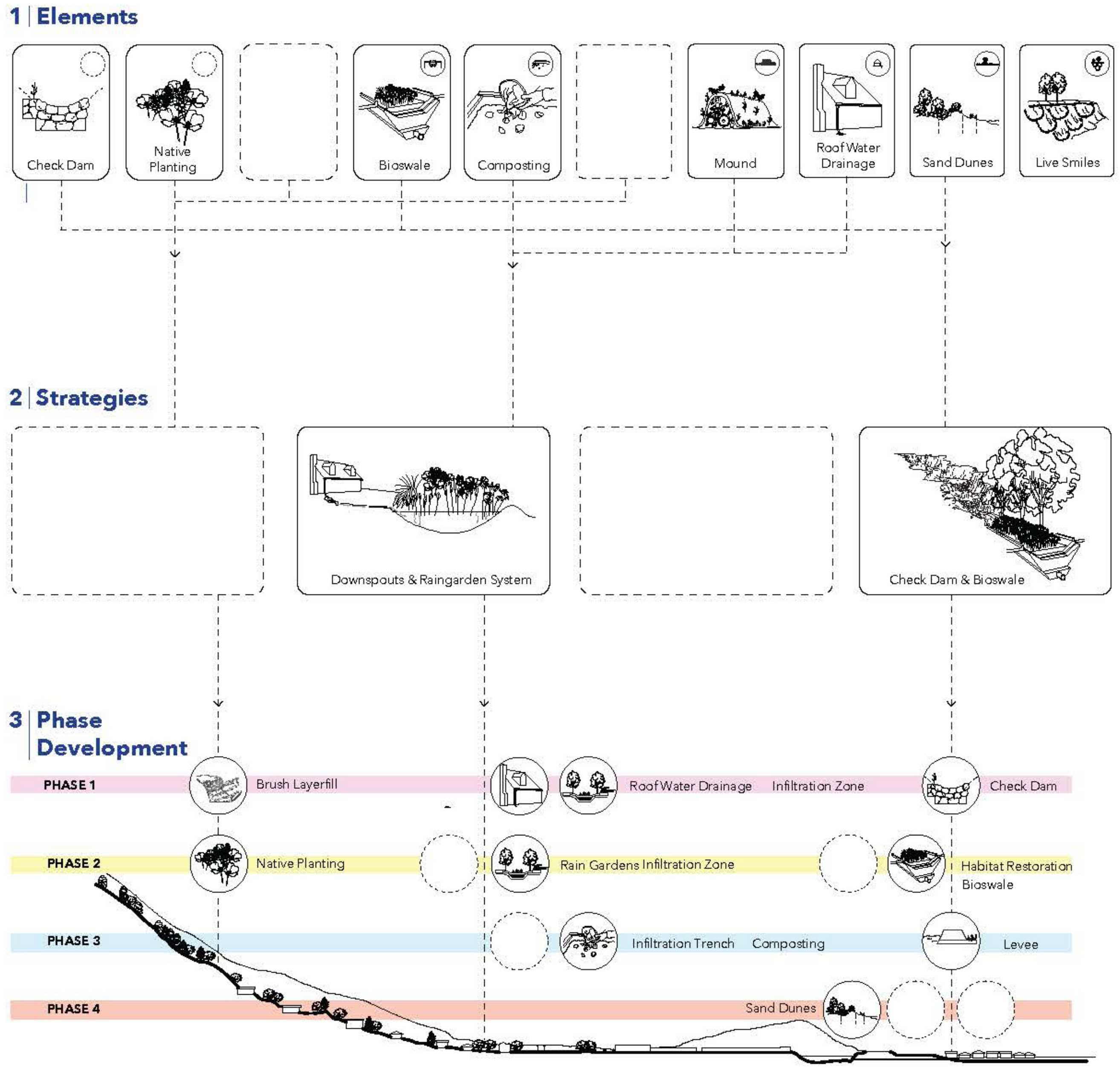


Image:
The People's Plan for Resilient by Design in Marin County, California. Shows a cross sectional tool for educating the public about how to combine Green Infrastructure components by the Permaculture + Social Equity Team. Drawing is provided by permission from the UEDLAB by Samantha Monge Kaiser

6. DESIGN PRINCIPLES

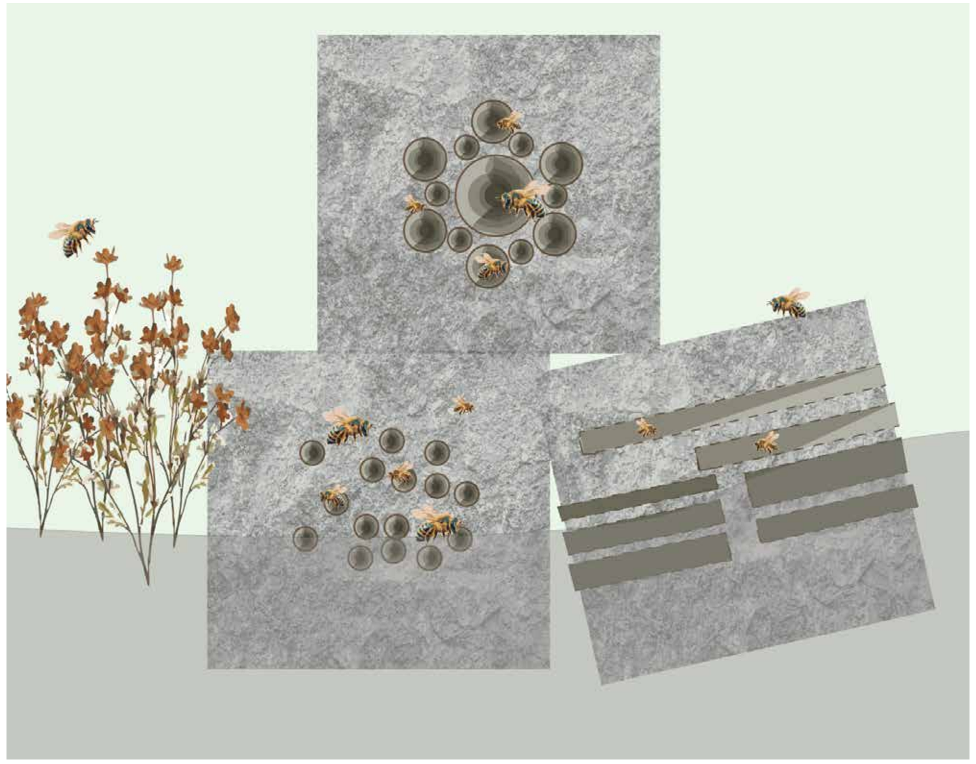
Image: Phoebe Powell

ENHANCE ENVIRONMENTS

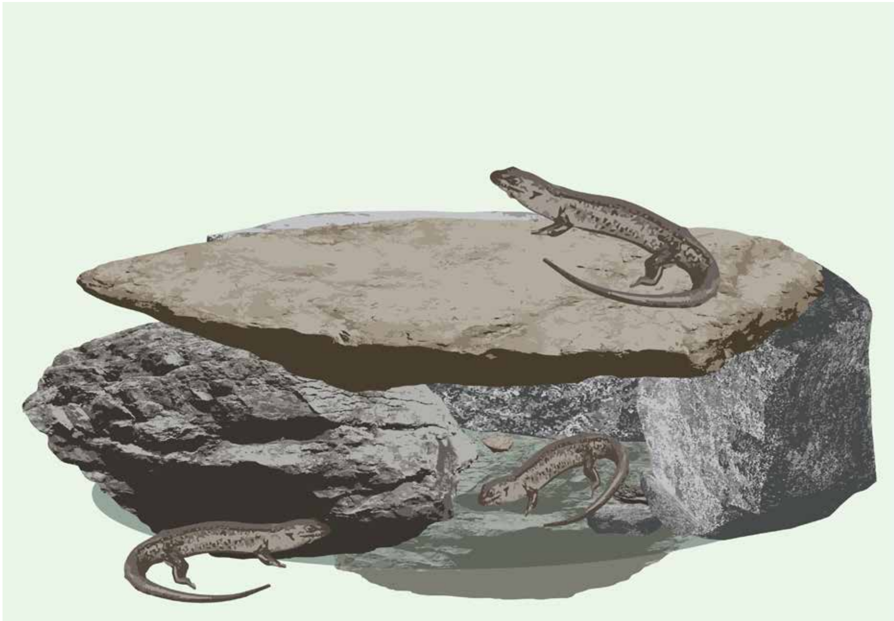
Enhancing environments is essential for supporting specific species and ensuring viable spaces for nesting, foraging, and shelter—especially under changing climate conditions. Designed habitats should enable species interactions and promote ecological functions at multiple scales.

A key priority is cultivating robust populations that can persist within the fragmented and isolated habitat patches common in urban areas. Establishing connectivity between these sub-populations supports genetic diversity and increases resilience to climate change and periodic disturbances.

Arranging habitats in clusters near key resources can create stepping stones and refugia, supporting a wider range of species and offering diverse habitat types within a compact area.

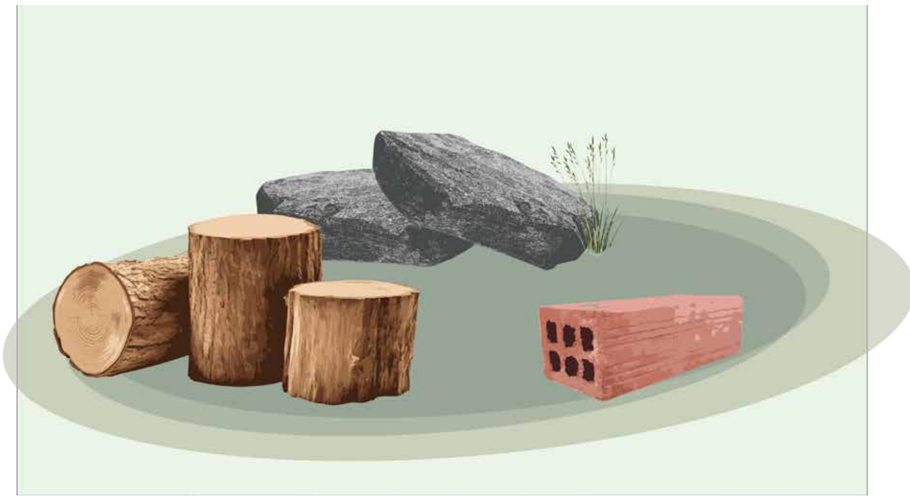


Design nesting spaces that enhance habitat values for priority species while avoiding supporting unwanted pests or invasives species.

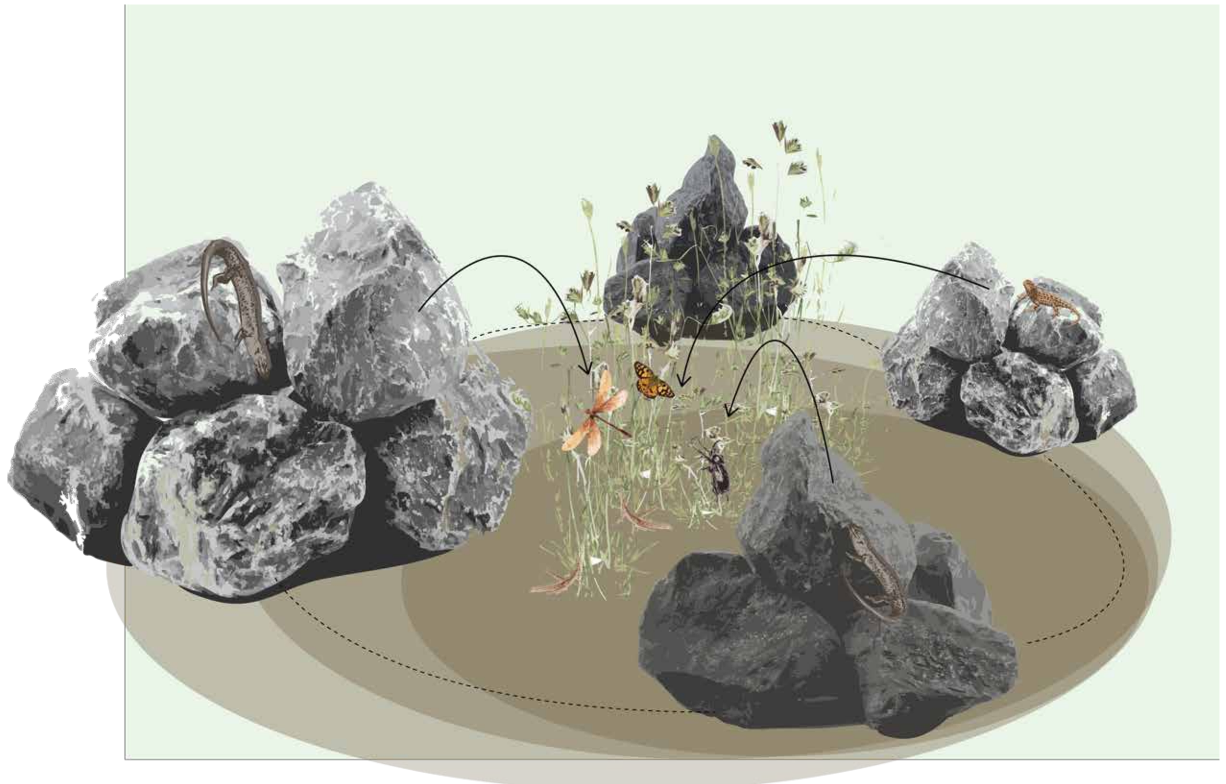


Construct shelter with a combination of protection from harsh climate conditions and invasive predators, while facilitating healthy species interactions.

Include below ground components for burrow behaviour, hiding and nesting and to provide refugia from heat.



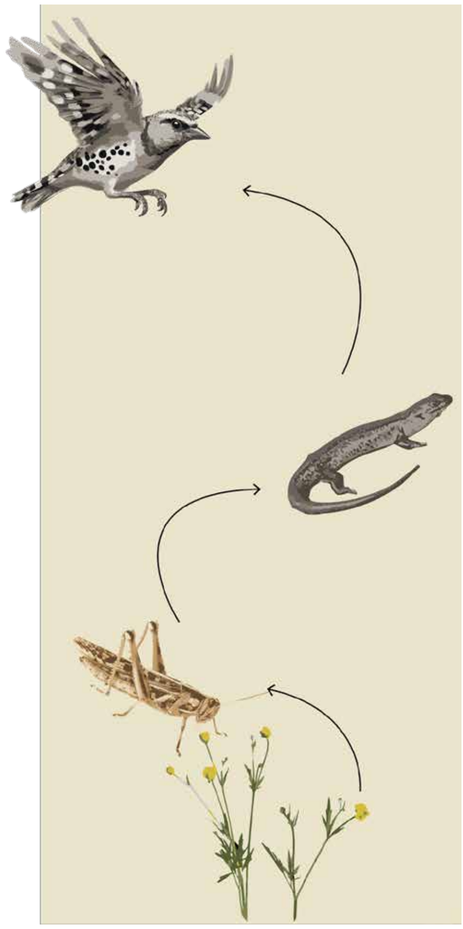
Prioritise recycled and natural materials that break down over time, supporting soil rehabilitation, burrowing, and nesting. This combination of materials should foster lower trophic structures in the food web, that support greater biodiversity.



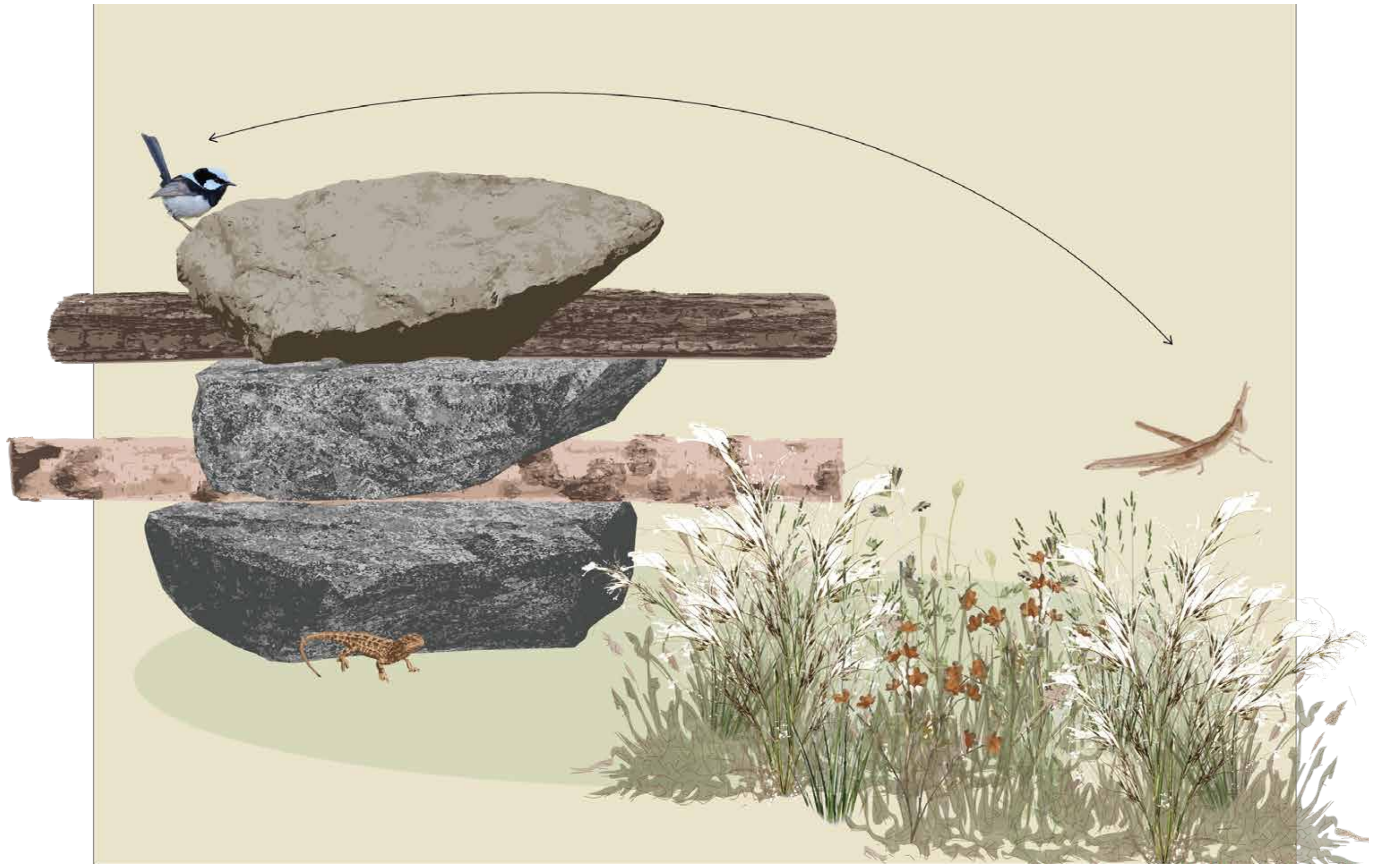
Arrange habitats in clusters that include both distinct and shared resources to support a variety of habitat conditions while maintaining some consistency. This redundancy helps ensure that, if certain plant or animal populations decline or are lost, nearby habitats can serve as sources for recovery and regeneration

PROMOTE SPECIES INTERACTIONS

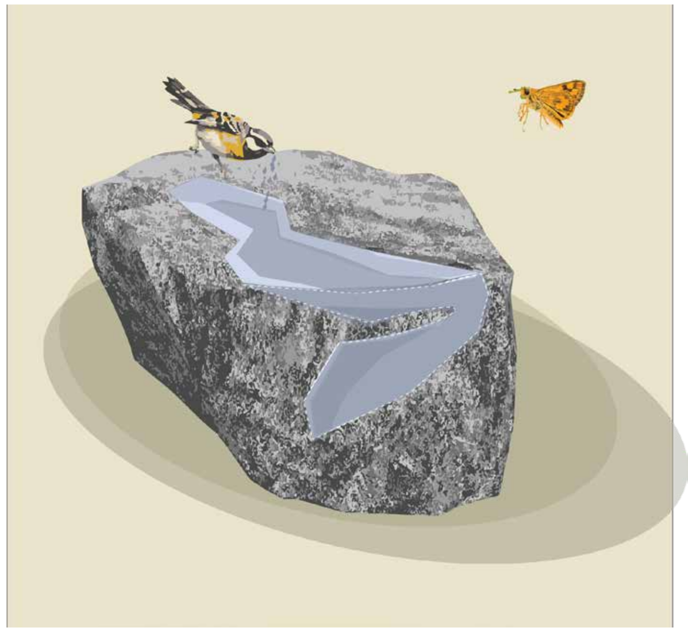
Promoting species interactions is essential to fostering dynamic, interconnected communities and resilient ecosystems. By incorporating knowledge and experimentation around the diet, behaviour, and preferences of target species, habitats can be designed and arranged in ways that support their persistence and success. Providing accessible food, water, and other key resources—particularly those that attract species lower on the trophic scale—can, in turn, draw a broader range of fauna and support complex feeding relationships.



Utilise foodweb principle to attract other species to boost biodiversity.

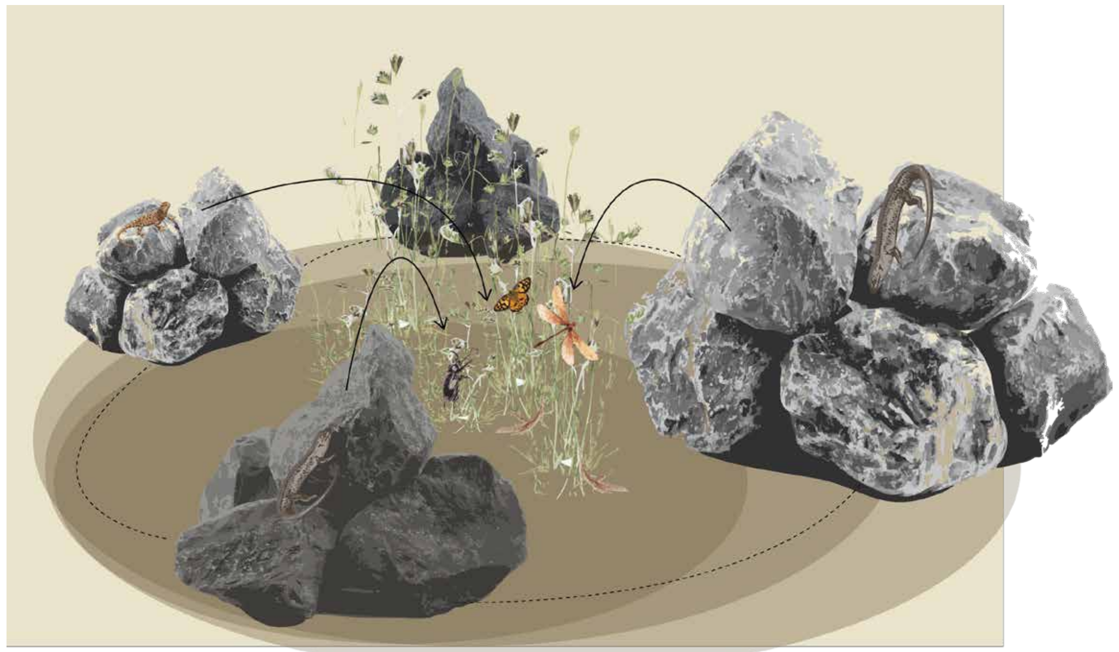


Place useful habitats for preferred predators in clusters and within close proximity to their prey's habitat to encourage healthy predator-prey dynamics of organisms such as ground dwelling insects.



Carve out space for water with some protection to support local species and attract other fauna species that may feed on the visitors.

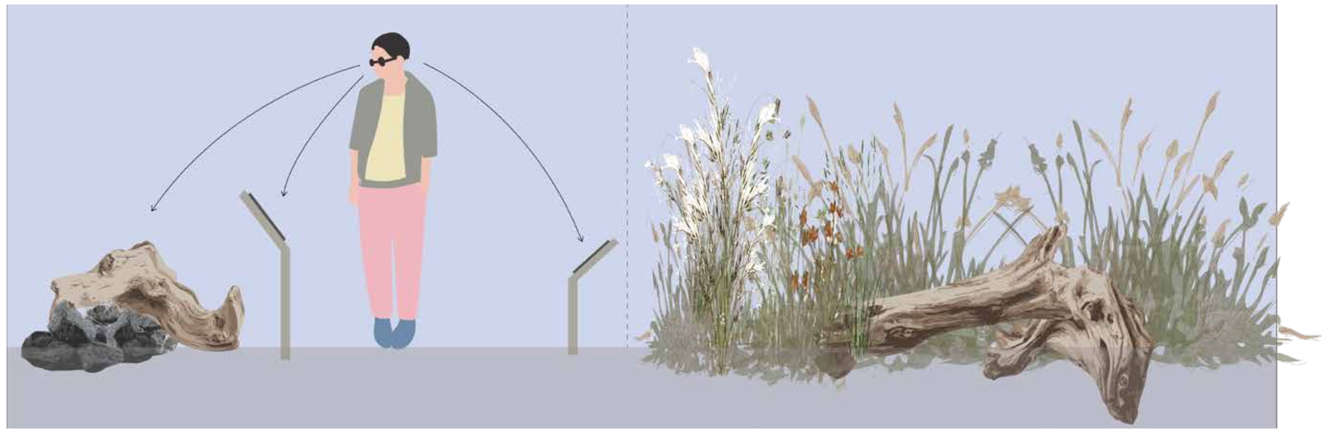
Design access for focused species, restricting pets or larger animals while encouraging public awareness around nesting.



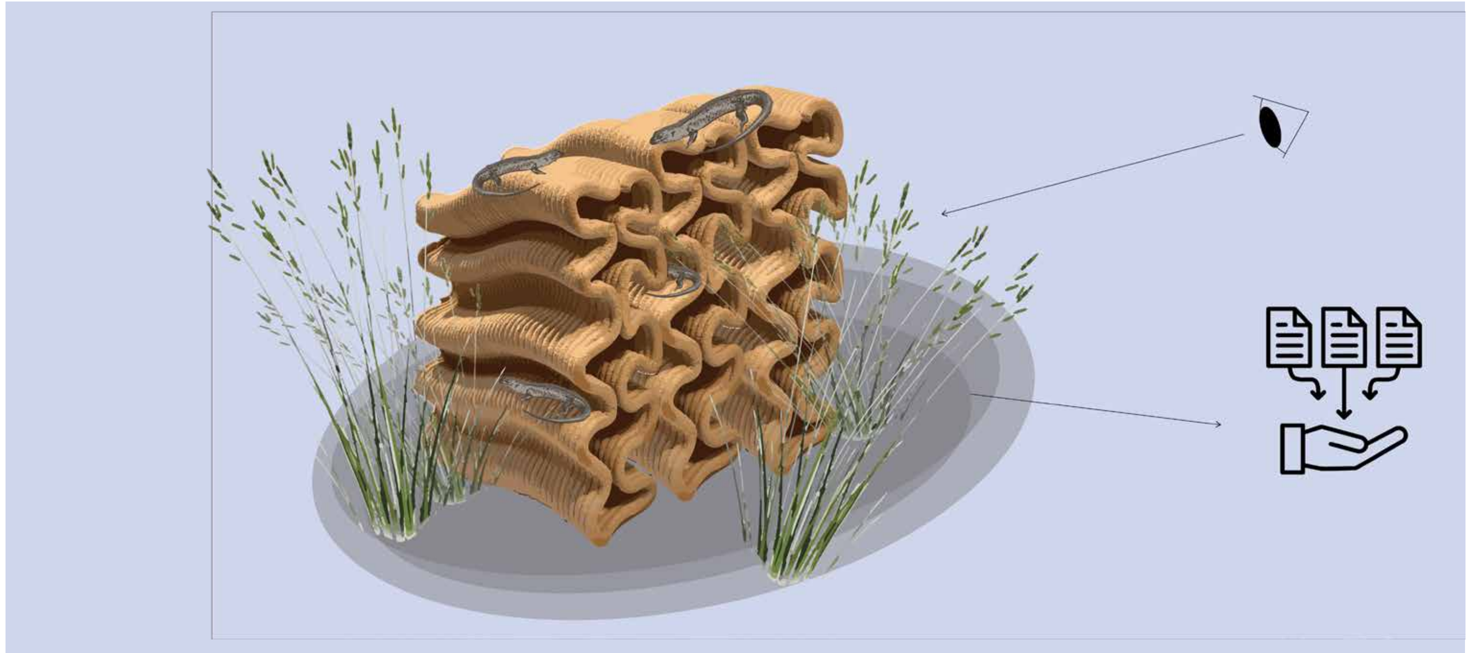
Arrange a series of habitat clusters to encourage species interactions over time while also allowing for refugia.

PRIORITISE HUMAN INTERACTIONS

Urban food webs are shaped not only by species dynamics but also by human activities. City landscapes are often fragmented and altered, which affects which species can live there and how they interact. People may introduce plants that attract pollinators, which in turn attract predators like birds. Urban planners, gardeners, and communities all play a role in shaping these systems. Because of this, urban food webs need to prioritise people. Every urban ecology project should consider ways of designing for different degrees of human interactions and management. The information collected from monitoring the designed habitat is valuable in educating the public about other life forms living in the same space. All installation of designed habitats should allow safe human interaction.



Allow a mix of interact-able and restricted designed habitats, fulfilling different types of goals on one site

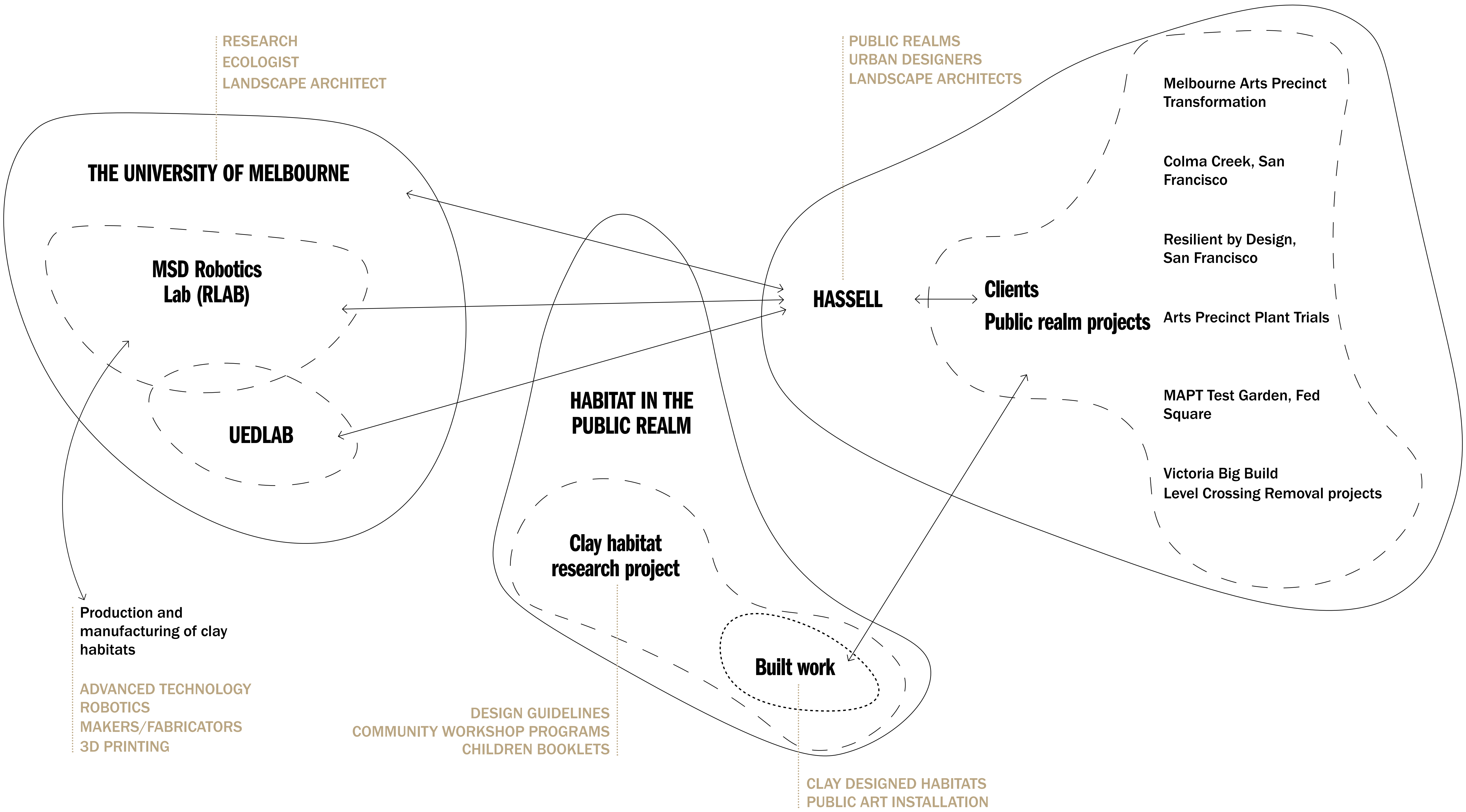


Monitor and collect data for ongoing learning and research.

Share data and findings to improve biodiversity in other areas to create better green public spaces

Install designed habitats as art elements in a public realm with multiple functions, for example, using planting as a framing element as well as a fencing element.

COLLABORATIONS



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