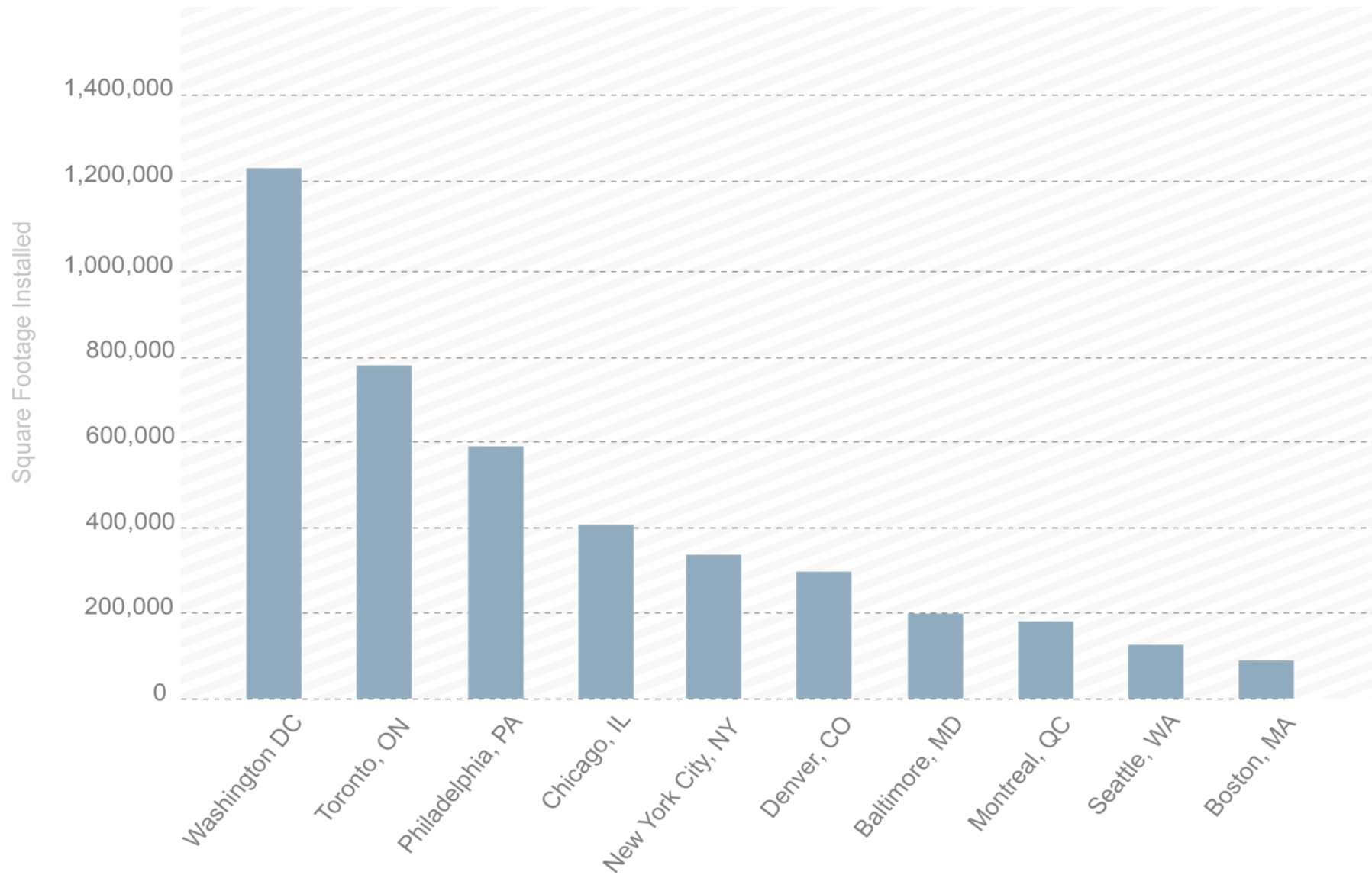


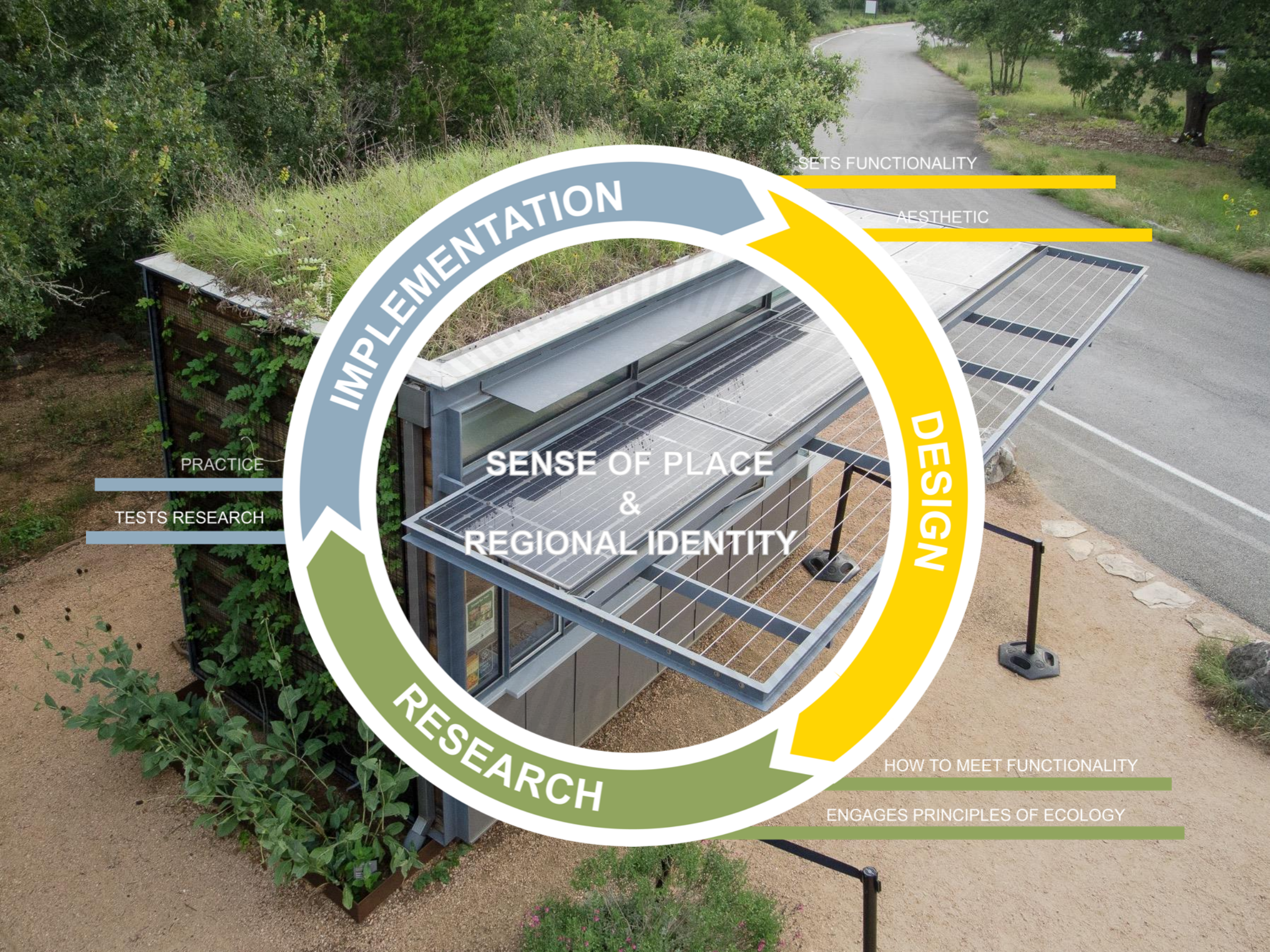
Catalyzing Design-Science Feedback Loop in Green Roof Optimization for Hot Climates



GREEN ROOF IMPLEMENTATION NATIONWIDE

Top 10 North American metro Regions in
Square Feet of Green Roofs Installed in 2014





IMPLEMENTATION

DESIGN

RESEARCH

PRACTICE

TESTS RESEARCH

SENSE OF PLACE & REGIONAL IDENTITY

SETS FUNCTIONALITY

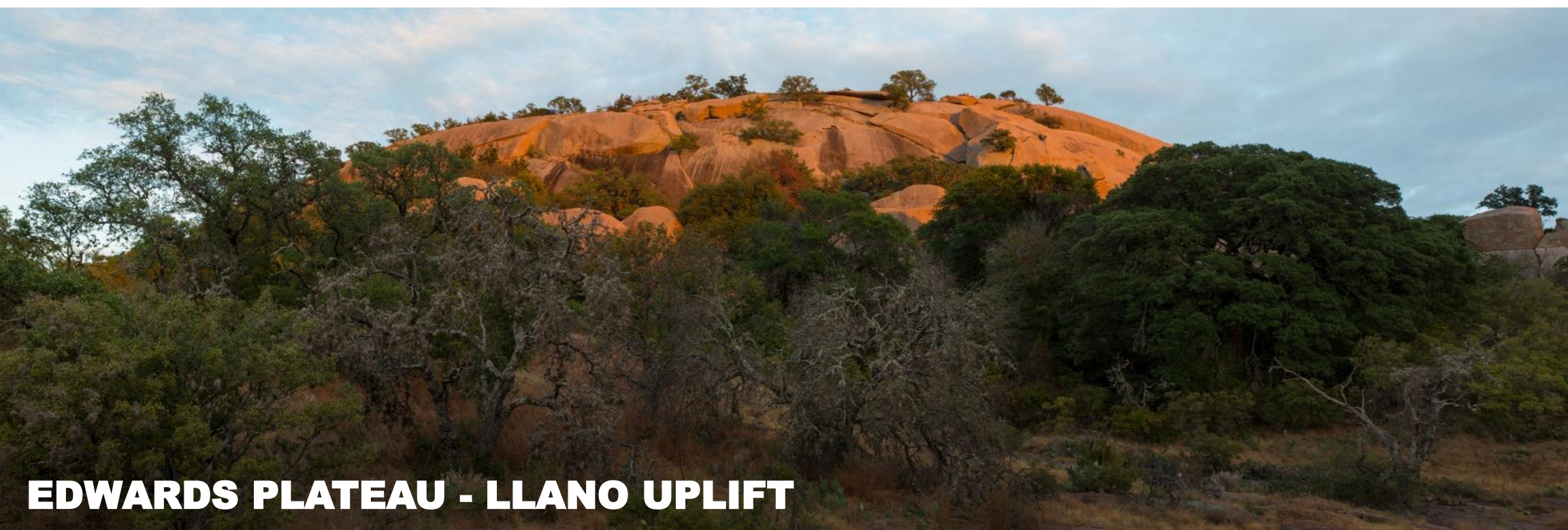
AESTHETIC

HOW TO MEET FUNCTIONALITY

ENGAGES PRINCIPLES OF ECOLOGY



BLACKLAND PRAIRIE



EDWARDS PLATEAU - LLANO UPLIFT



**EXISTING MEDIA + BLACK + WHITE ROOFS
TEMPERATURE, PLANT SURVIVAL, RUNOFF**

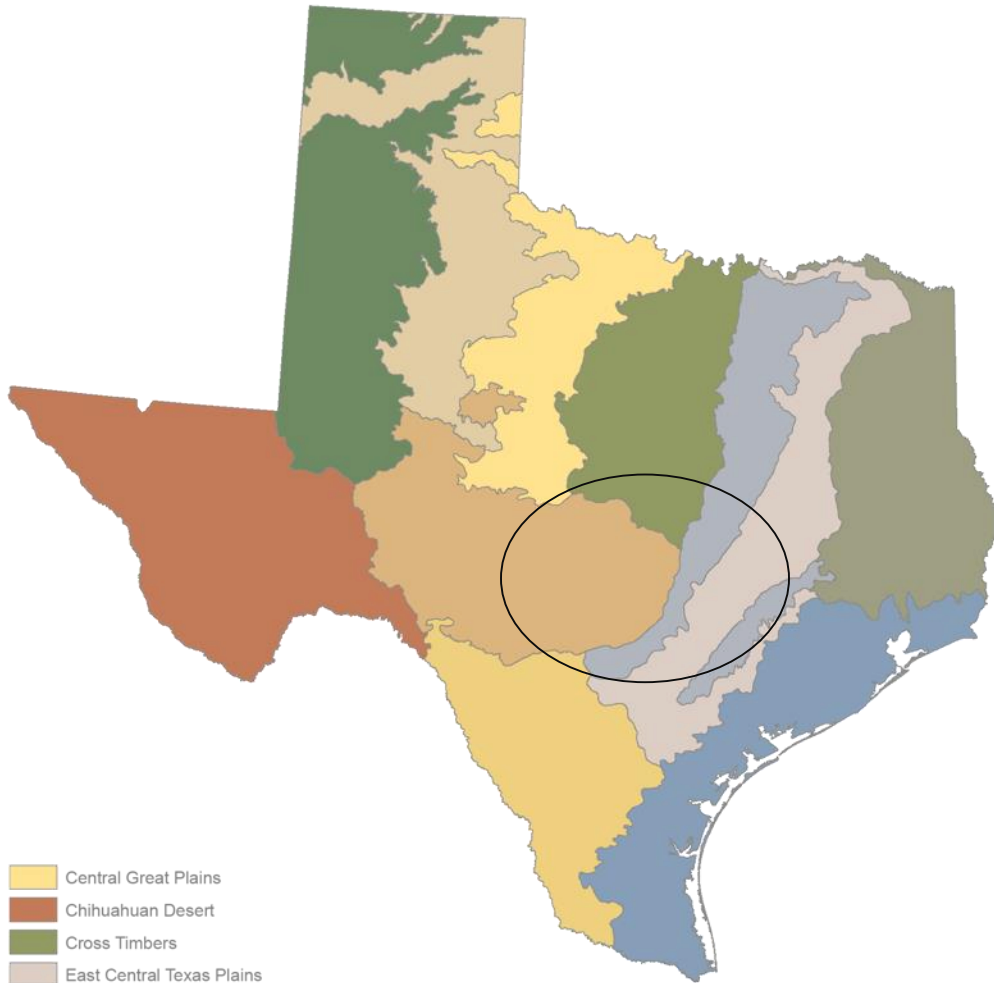
**VARIED WILDLY WITH DESIGN
SET FUNCTIONAL GOALS UP FRONT AND DESIGN FOR THEM**



Simmons et al. 2008

REGION OF EXTREME CLIMATE

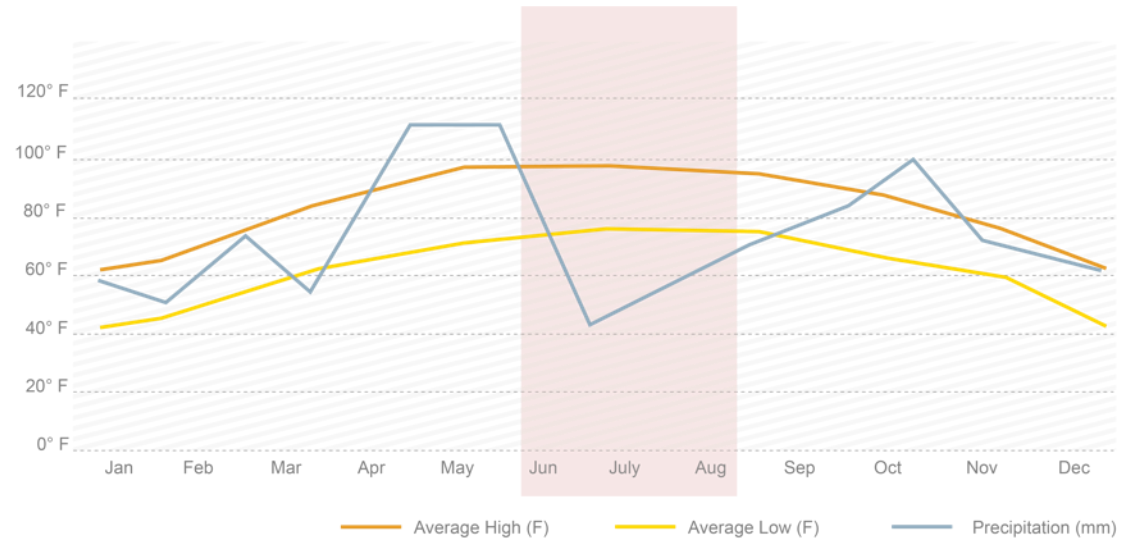
Texas Ecoregions



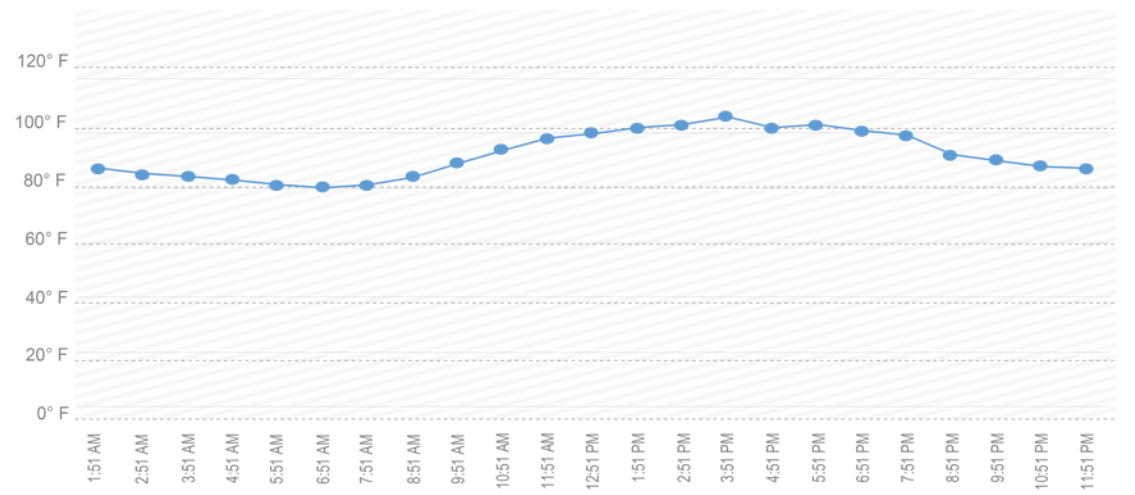
- Central Great Plains
- Chihuahuan Desert
- Cross Timbers
- East Central Texas Plains
- Edwards Plateau
- High Plains
- South Central Plains
- Southern Texas Plains
- Southwestern Tablelands
- Texas Blackland Prairies
- Western Gulf Coastal Plain



Austin, Texas Climate

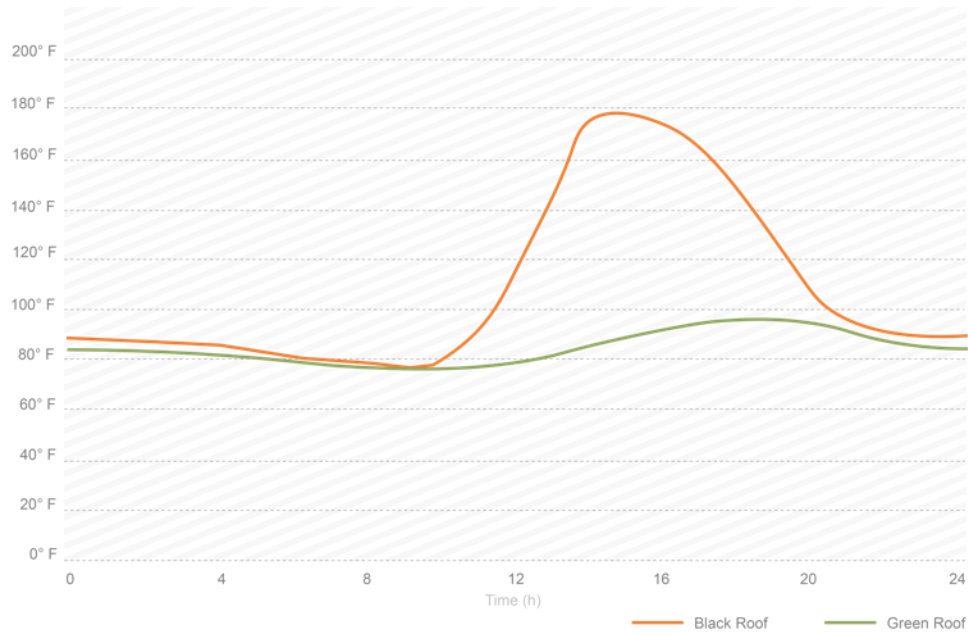


Hourly Temperature

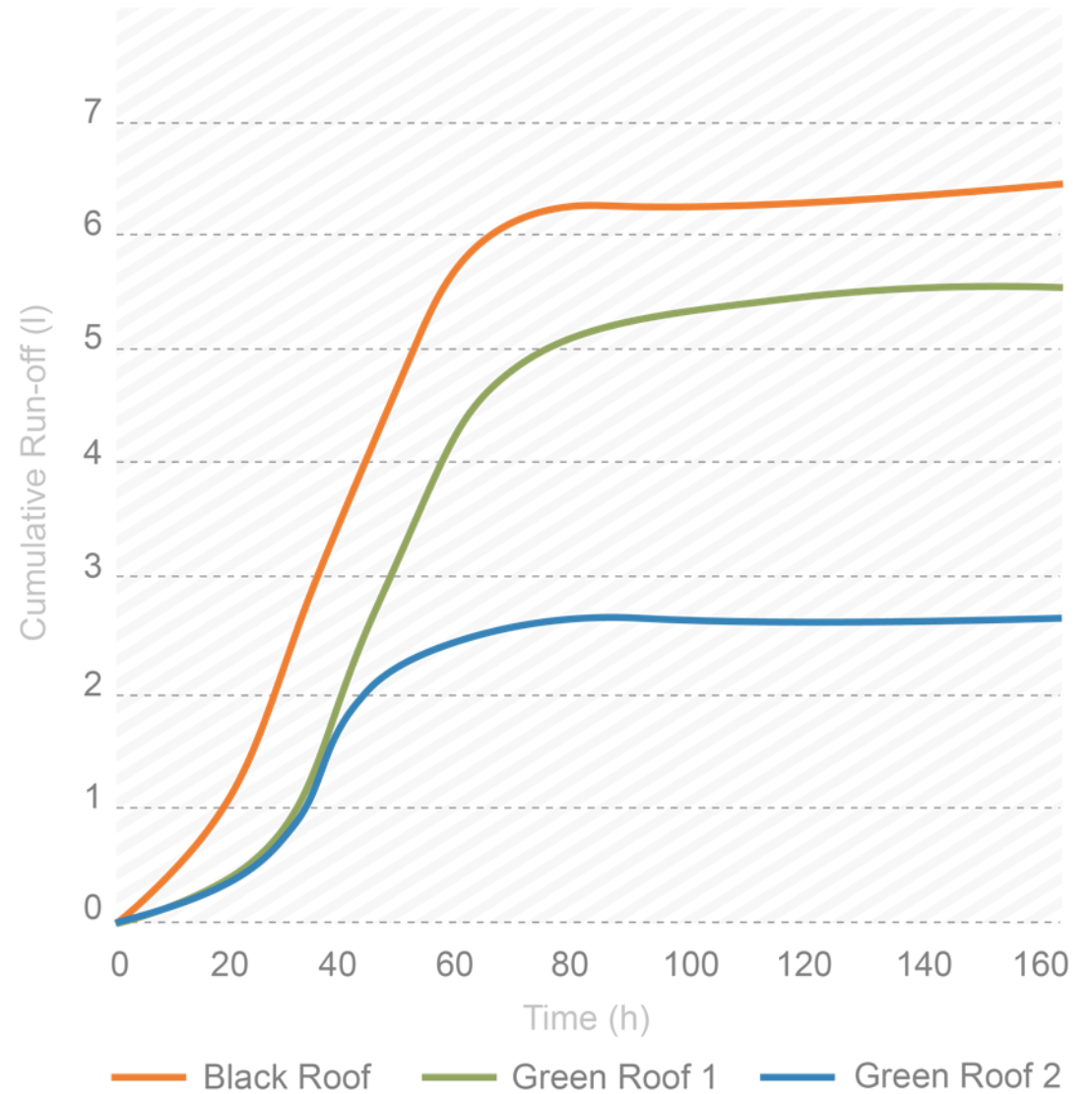


GREEN ROOF READINGS

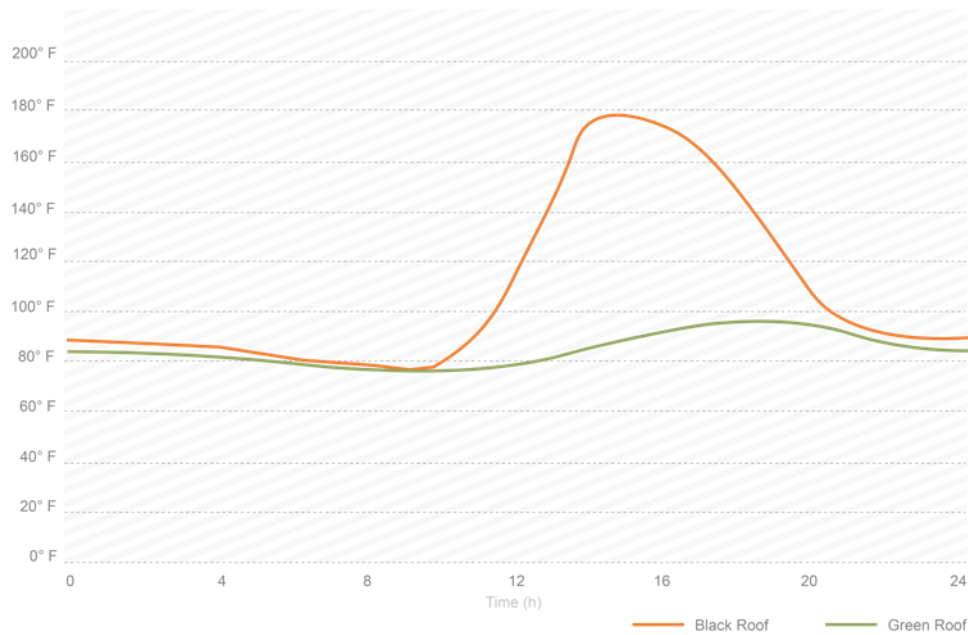
Diurnal Temperature Surface



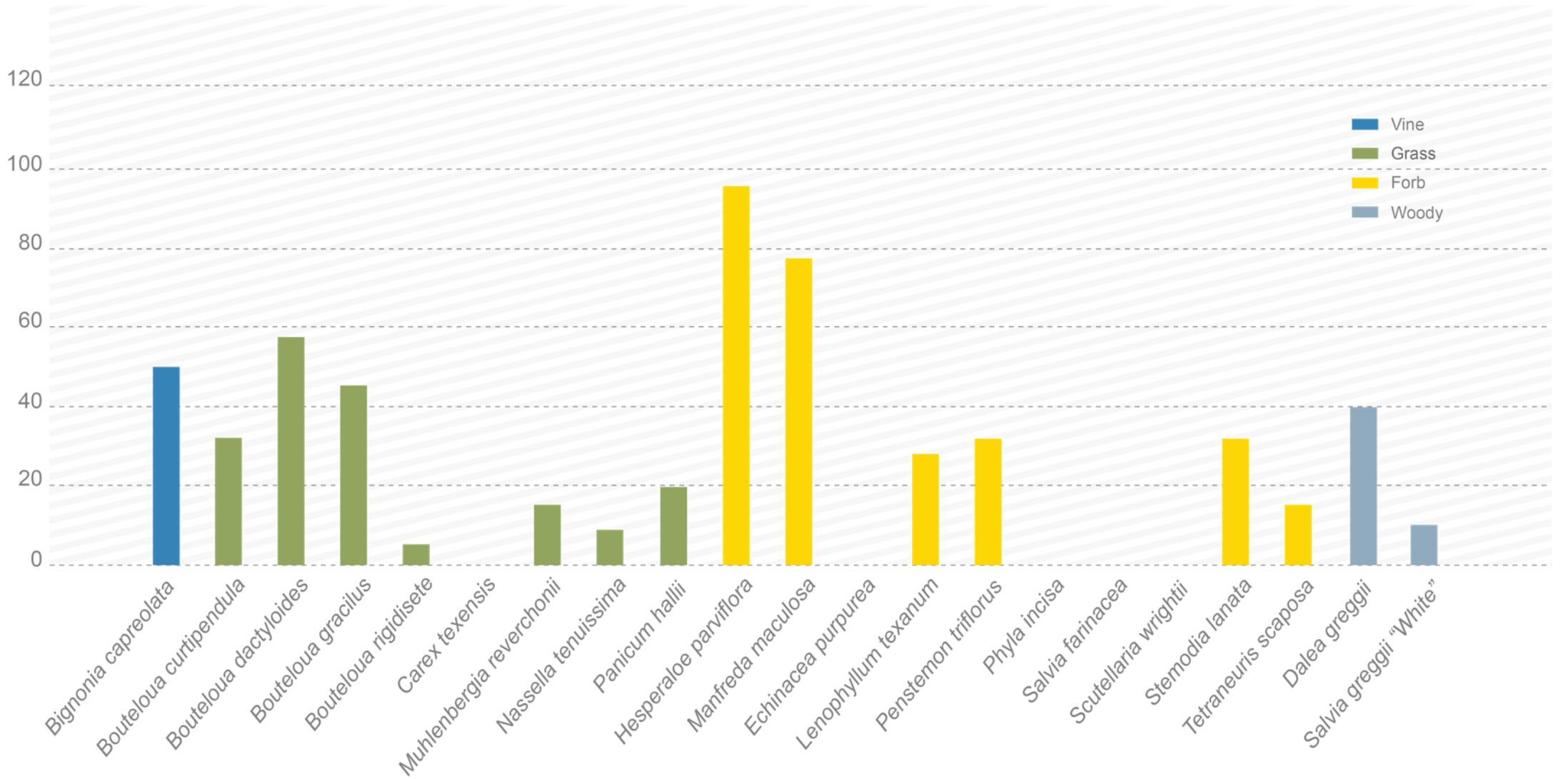
Cumulative Run-off Hydrograph



Diurnal Temperature Surface

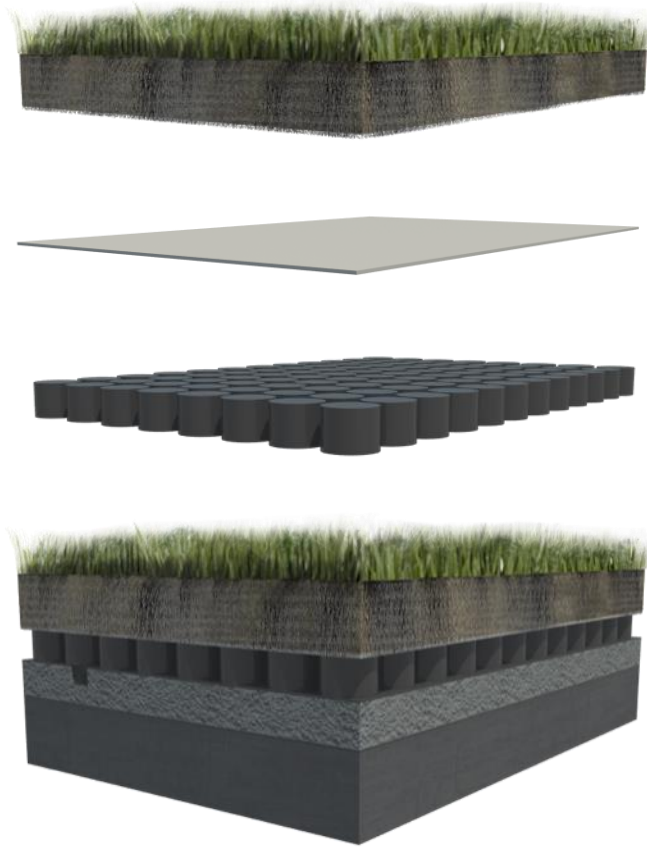


3 Year Survivorship

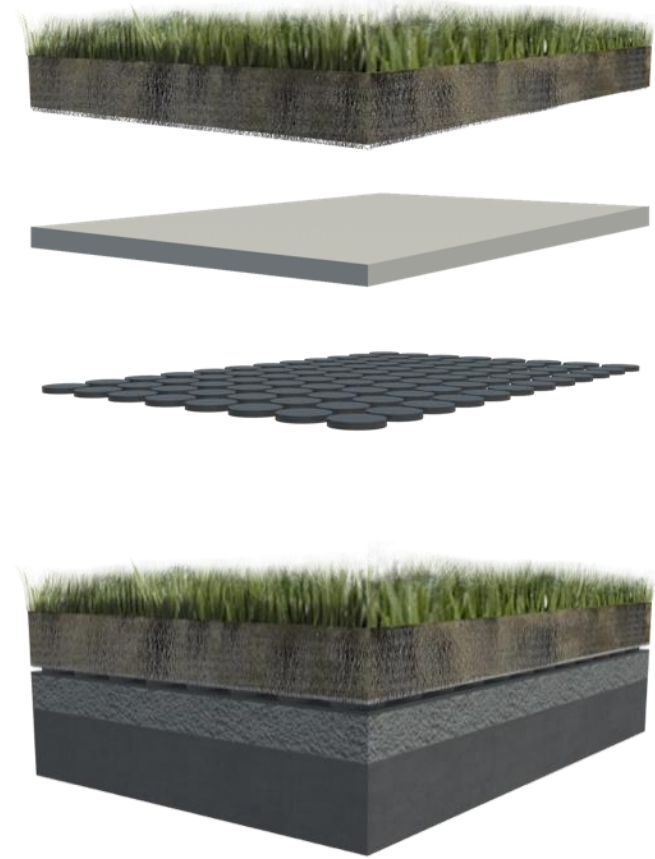




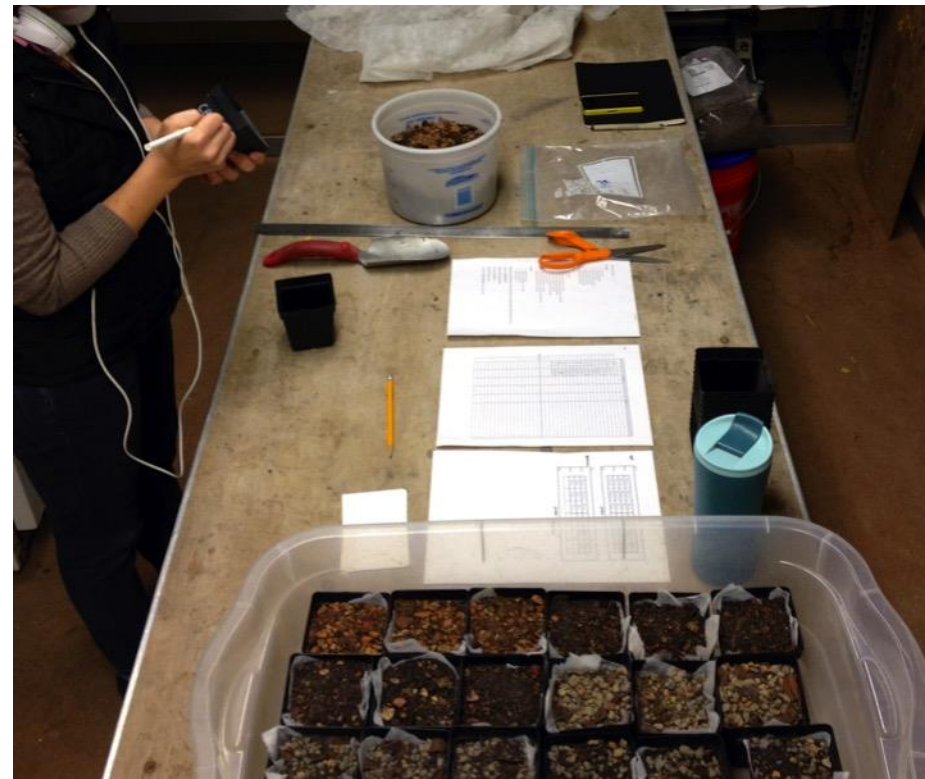
- >30C Root Stress
- >35C – 40C Root Death

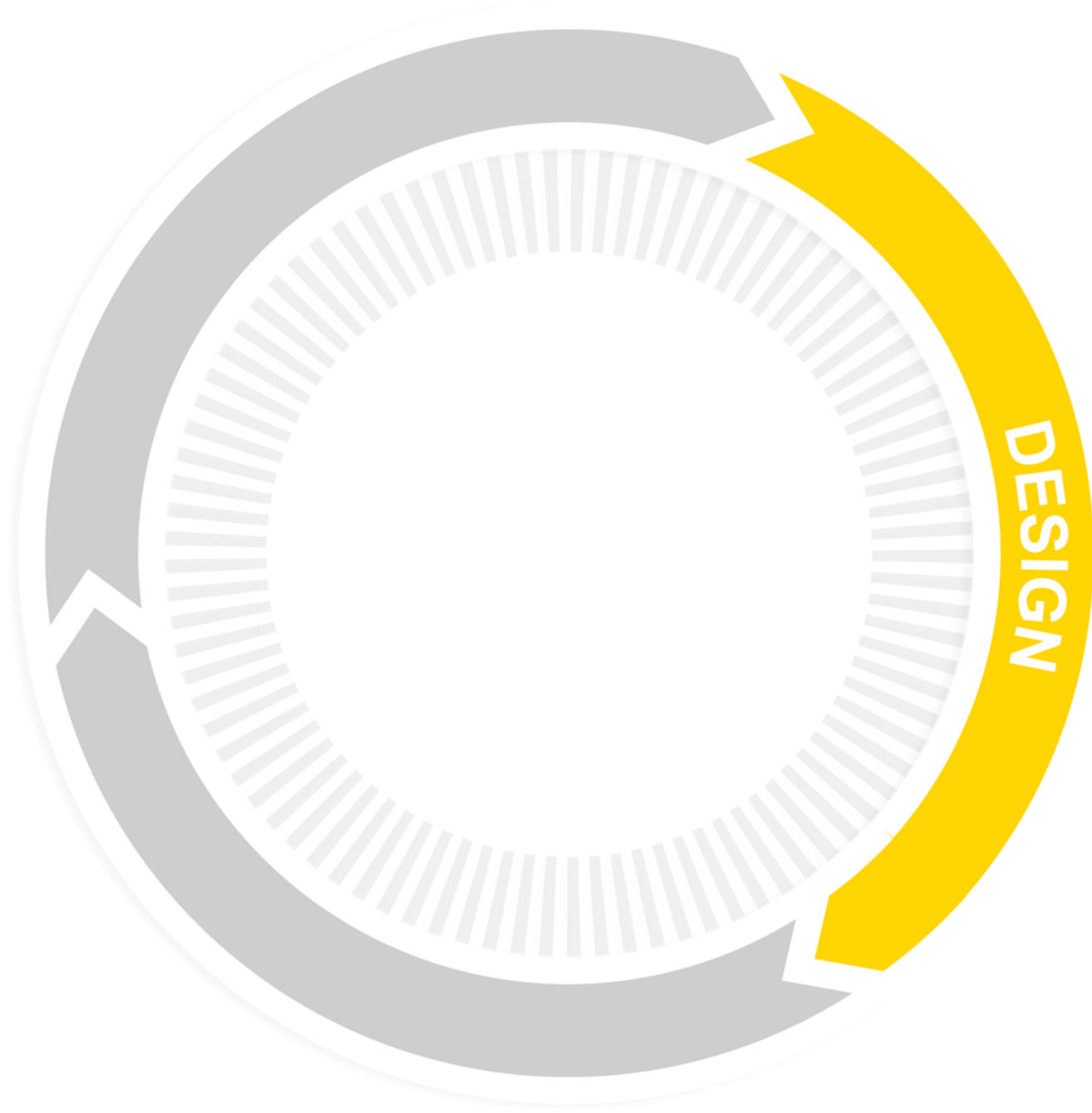


**CONVENTIONAL
GREEN ROOF**



**ARID / SOUTHWEST
GREEN ROOF**





DESIGN

SET FUNCTIONAL & AESTHETIC GOALS UP FRONT

+

REDUCED AIR VOLUME

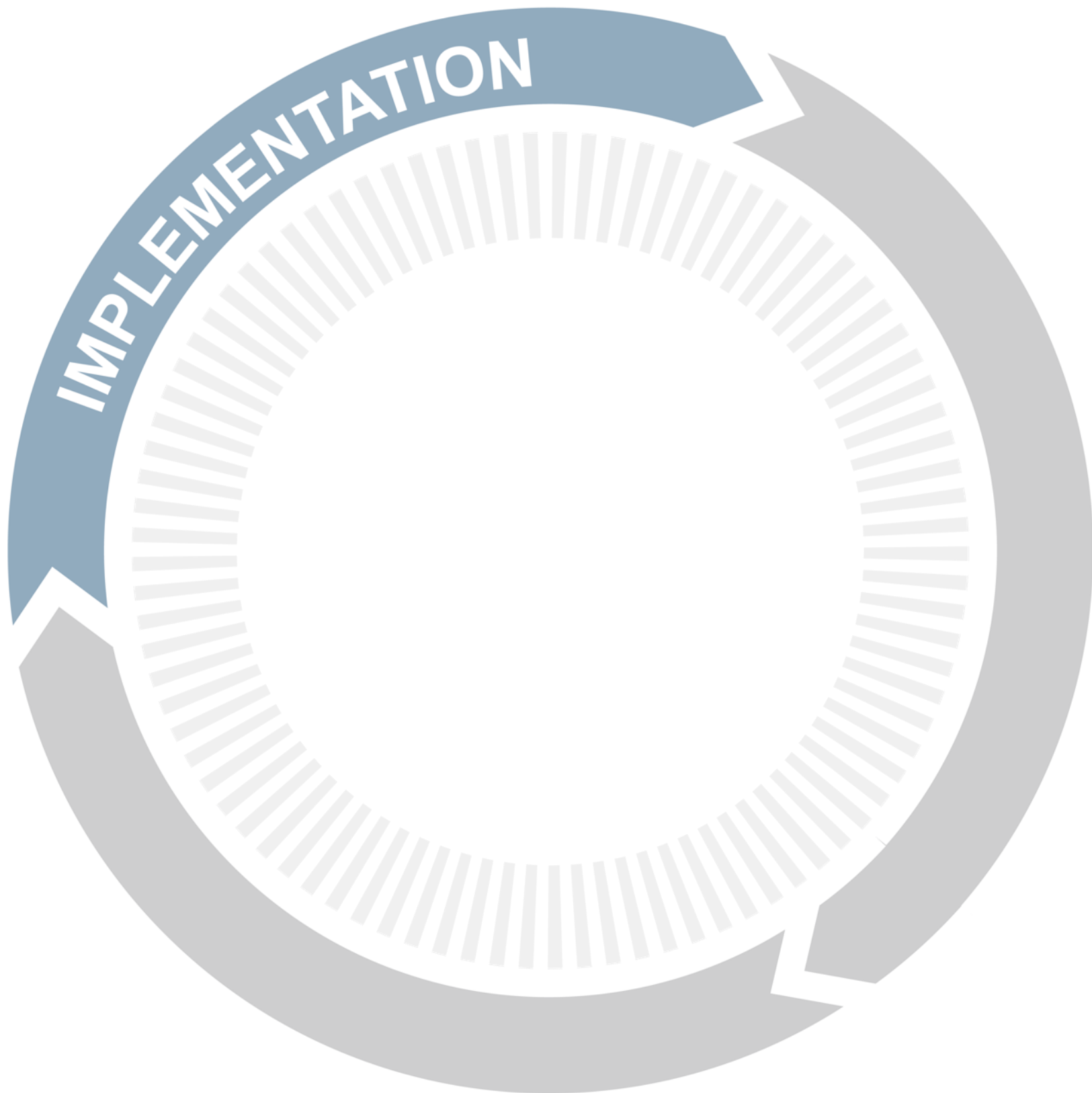
+

PROPER SOIL MEDIA

+

APPROPRIATE VEGETATION





IMPLEMENTATION















Case Study - Edgeland

RESEARCH

FORBS

Huisache Daisy (Amblyolepis setigera)

Antelope horns (Asclepias asperula)

Butterfly weed (Asclepias tuberosa)

Winecup (Callirhoe involucrate)

Partridge pea (Cassia fasciculata)

Indian paintbrush (Castilleja indivisa)

American basketflower (Centaurea Americana)

Lanceleaf coreopsis (Coreopsis lanceolata)

Coreopsis lanceolata (Corydalis curvisiliqua)

Corydalis curvisiliqua (Desmanthus illinoensis)

Desmanthus illinoensis (Echinacea angustifolia)

Echinacea angustifolia (Engelmannia pinnatifida)

Indian blanket (Gaillardia pulchella)

White Gaura (Gaura lindheimeri)

Standing cypress (Ipomopsis rubra)

Gayfeather (Liatris mucronata)

Texas Yellow Star (Lindheimera texana)

Blue flax (Linum lewisii)

Texas bluebonnet (Lupinus texensis)

Horsemint (Monarda citriodora)

Missouri primrose (Oenothera missouriensis)

Pink evening primrose (Oenothera speciose)

White prairie clover (Petalostemum candidum)

Purple prairie clover (Petalostemum purpurea)

Clasping coneflower (Rudbeckia amplexicaulis)

Black-eyed Susan (Rudbeckia hirta)

Mealy blue sage (Salvia farinacea)

Prairie verbena (Verbena bipinnatifida)

Greenthread (Thelesperma filifolium)

Prairie coneflower (Ratibida columnifera)

Bush sunflower (Simsia calva)

Cutleaf daisy (Engelmannia peristenia)

Maximilian sunflower (Helianthus maximiliani)

Scarlet sage (Salvia coccinea)

Wild floxglove (Penstemon cobaea)

Annual winecup (Callirhoe leiocarpa)

Clasping coneflower (Dracopis amplexicaulis)

Pitcher sage (Salvia azurea)

Prairie agalinis (Agalinis heterophylla)

Plains coreopsis (Coreopsis tinctoria)

Prairie verbena (Glandularia bipinnatifida var. bipinnatifida)

Rattlesnake master (Eryngium yuccifolium)

GRASSES

Eryngium yuccifolium (Aristida purpurea)

Sideoats grama (Bouteloua curtipendula)

Blue grama (Bouteloua gracilis)

Buffalograss (Bouteloua dactyloides)

Prairie wildrye (Elymus Canadensis)

Sand lovegrass (Eragrostis trichodes)

Green sprangletop (Leptochloa dubia)

Texas wintergrass (Nassella Leucotricha)

Western wheatgrass (Pascopyrum smithii)

Little bluestem (Schizocyrium scoparium)

Sand dropseed (Sporobolus cryptandrus)

Plains bristlegrass (Setaria vulpiseta)

Slim tridens (Tridens muticus)

White tridens (Triden albescens)

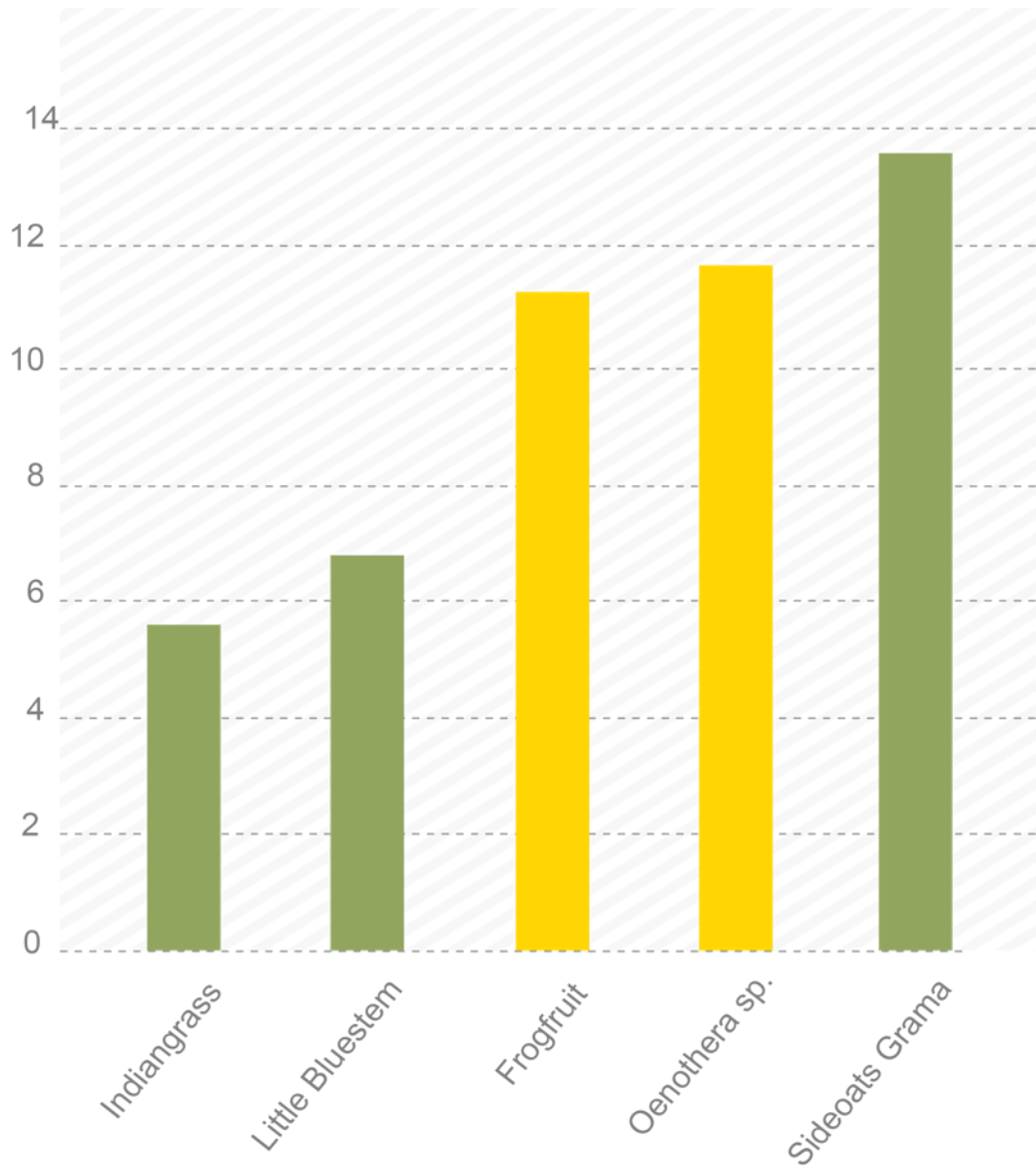
Red grama (Bouteloua trifida)

Arizona cottontop (Digitaria californica)

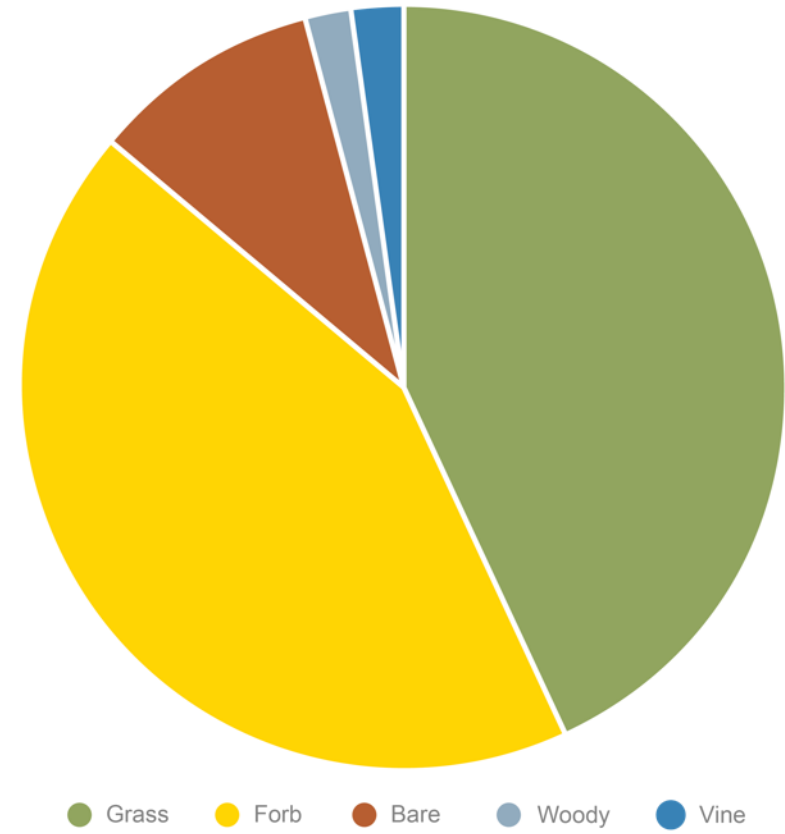
Hooded windmill grass (Chloris cucullata)

Curly mesquite (Hilaria belangeri)

Percent Cover of 5 Dominant Species

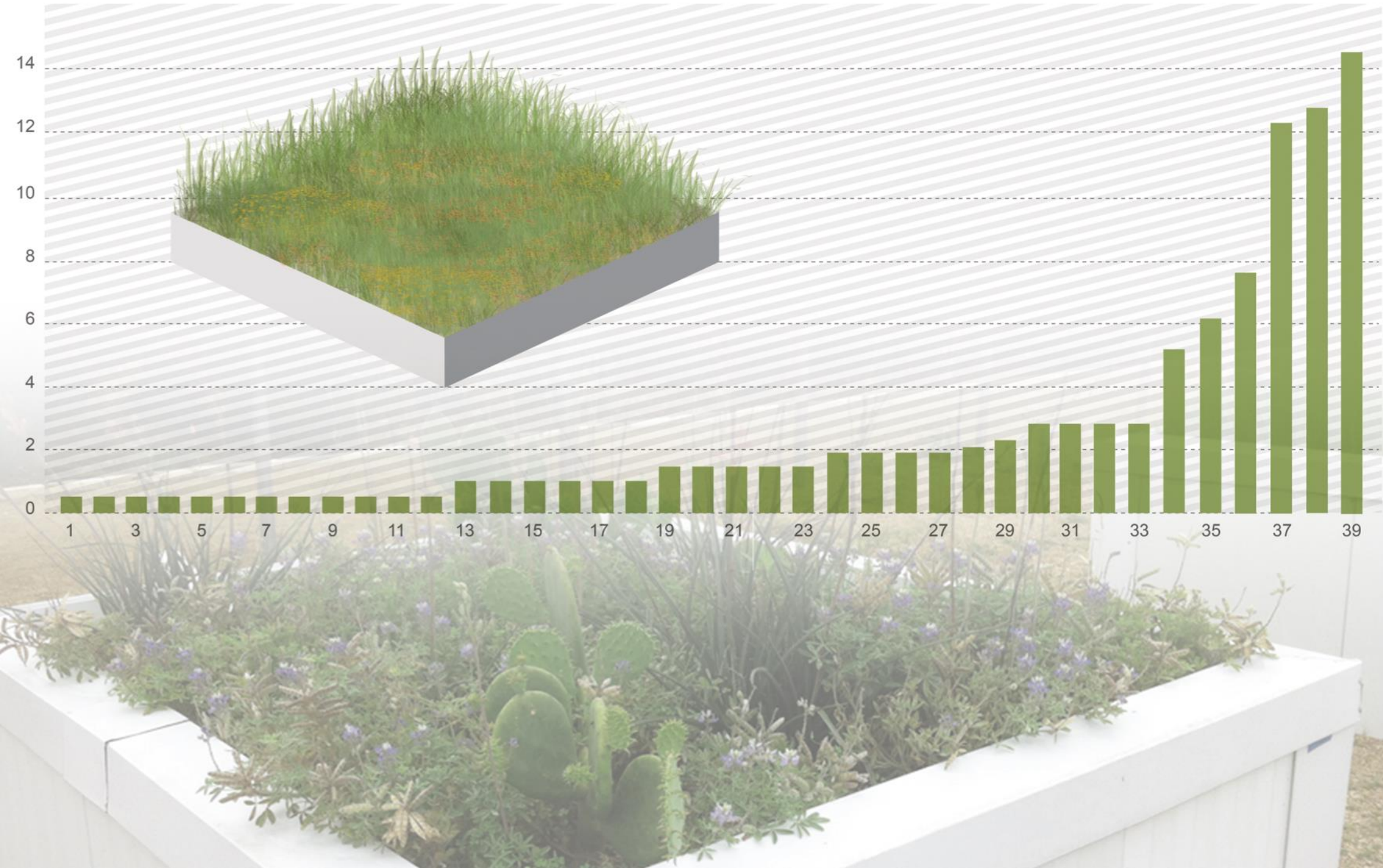


Overstory Percent Cover



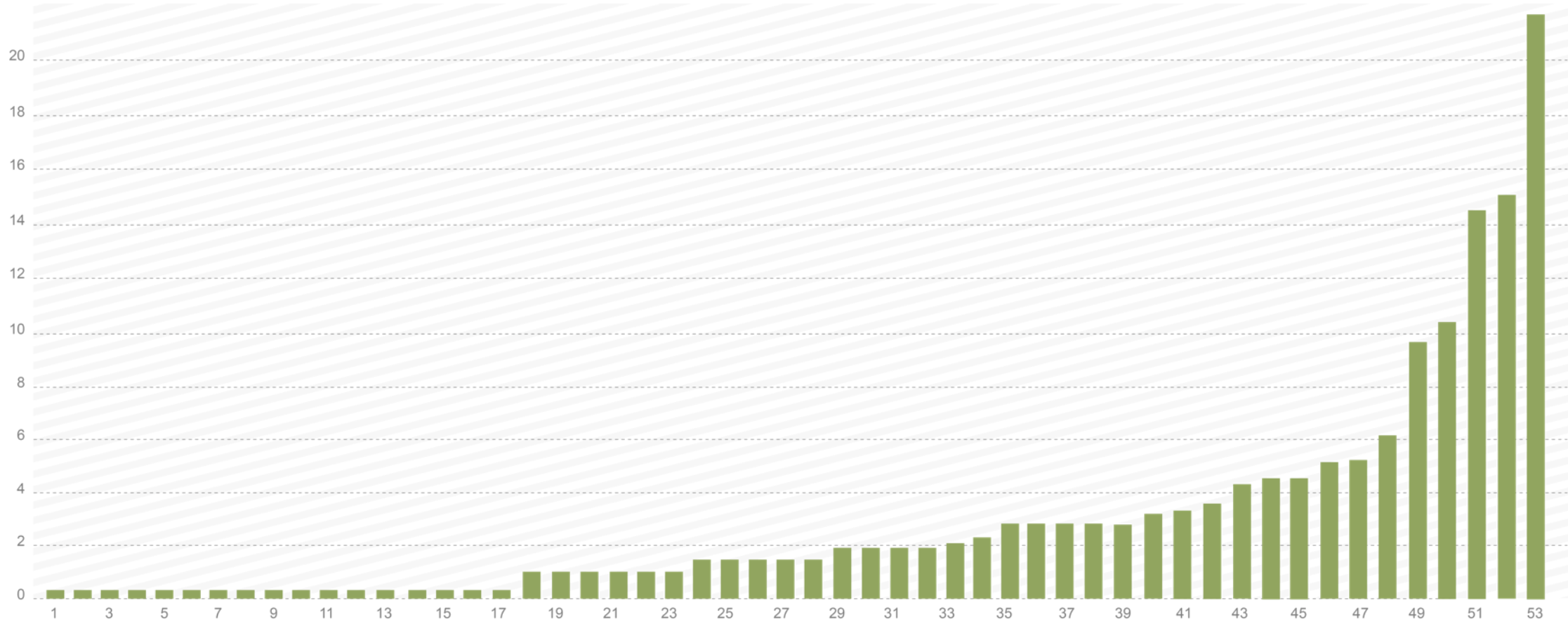
BIODIVERSE HYBRID ECOYSTEM

Percent Cover by Species of Green Roof



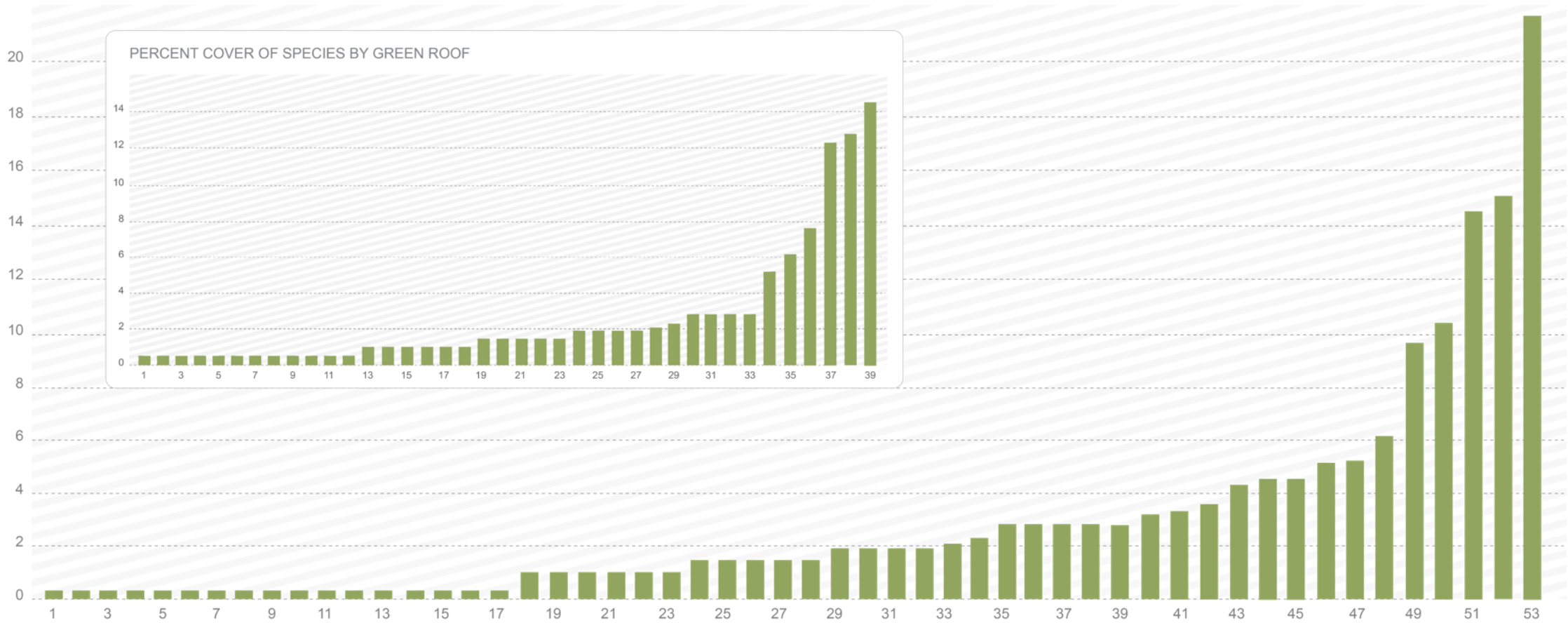
BIODIVERSE HYBRID ECOYSTEM

Percent Cover by Species of Prairie



BIODIVERSE HYBRID ECOYSTEM

Percent Cover by Species of Prairie



PROJECTS













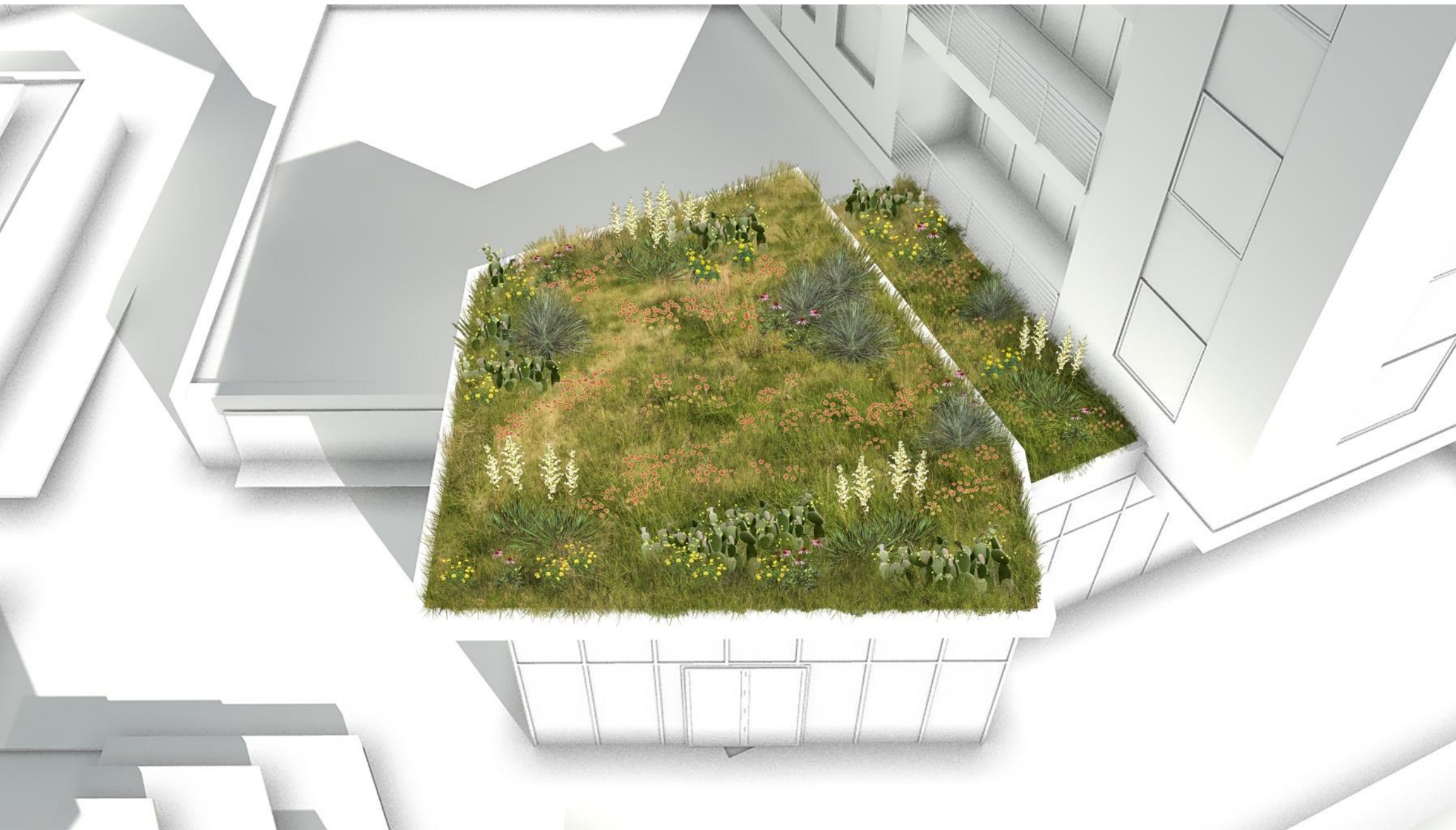


Lakes Edge BOAT HOUSE

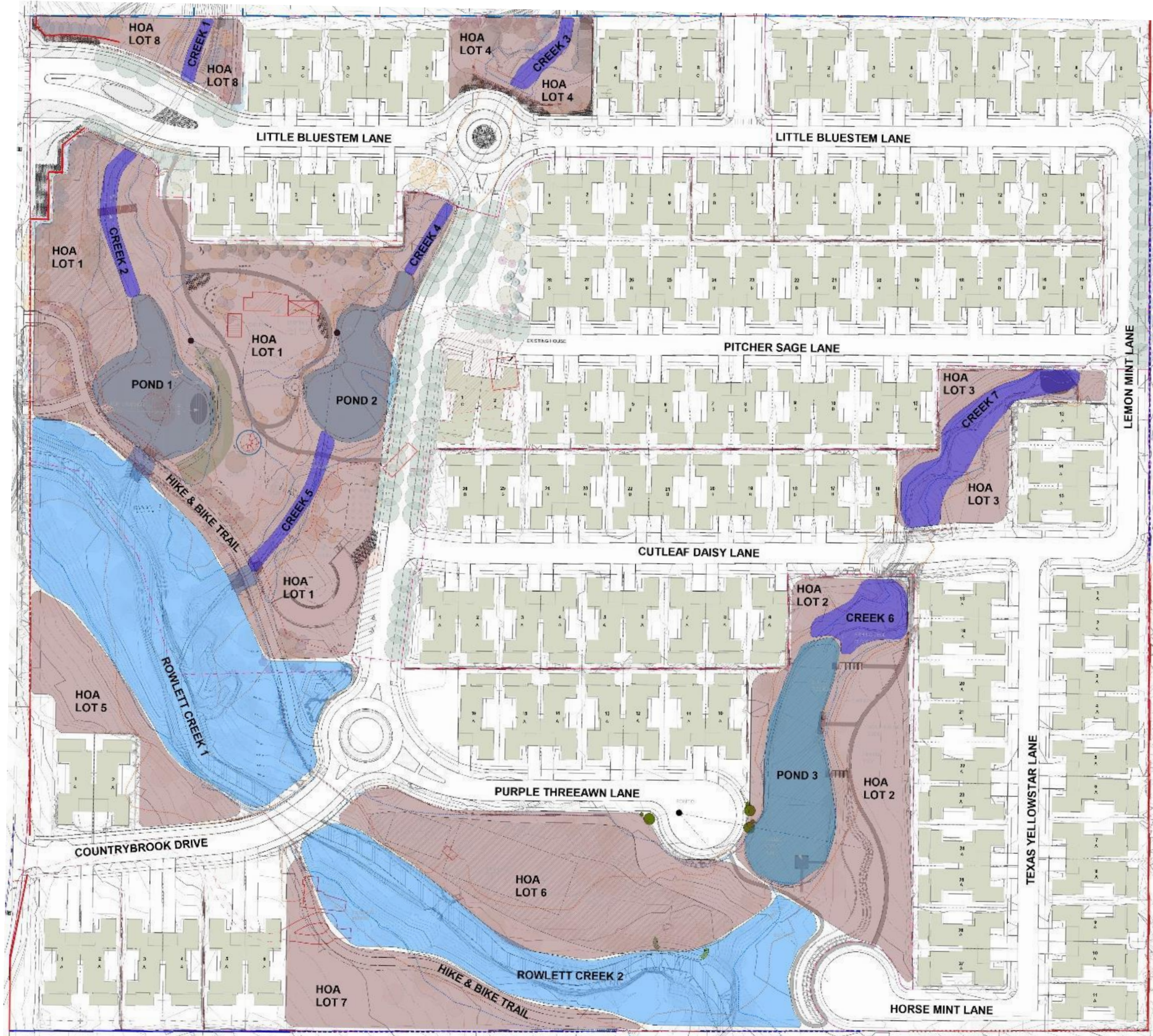
















THE UNIVERSITY OF TEXAS AT AUSTIN

WHAT STARTS HERE CHANGES THE WORLD