

STEPPING STONES

A PATCHWORK OF URBAN GREEN ROOFS

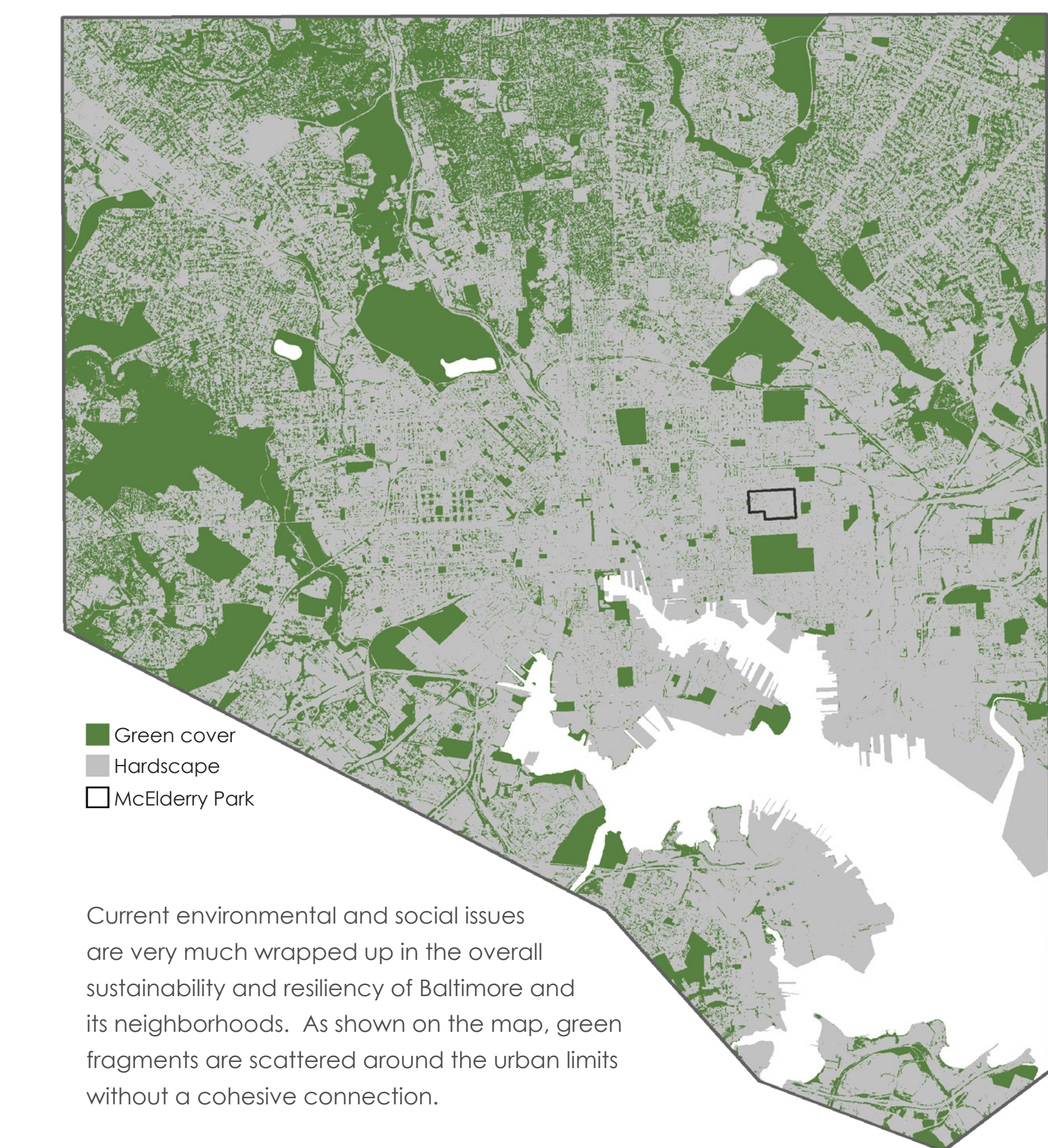


- ENVIRONMENTAL BENEFITS**
 - STORMWATER RUNOFF MANAGEMENT**
Permeable green space is significantly increased and allows stormwater to infiltrate before contributing to storm runoff.
 - BIODIVERSITY + WILDLIFE HABITAT**
Pollinator species of perennials, shrubs, sedum, and vines attract a diverse range of wildlife - providing habitat and nourishment.
 - URBAN HEAT ISLAND REDUCTION**
Increased green space (specifically on black-top roofs) absorbs less solar radiation than hardscape and lessens local air temperature.
 - AIR QUALITY PURIFICATION**
Implementation of plant species and green space increases photosynthesis to reduce carbon dioxide levels while producing oxygen.
- SOCIETAL BENEFITS**
 - SOCIAL INTERACTION + CIVIC PRIDE**
New green space encourages interaction among community and creates a landscape that residents are proud to maintain.
 - COMMUNITY EDUCATION**
School green roof serves as model for community education of plant species, urban agriculture, and various green roof benefits.
 - TEMPERATURE + NOISE INSULATION**
Layers of plant material and growing medium insulate rowhouse interiors from high/low temperatures and exterior city noises.
 - EXTENDED ROOF LIFESPAN**
Green roof materials protect standard black-top roofs from weathering over time and preserve roof conditions without requiring repairs.

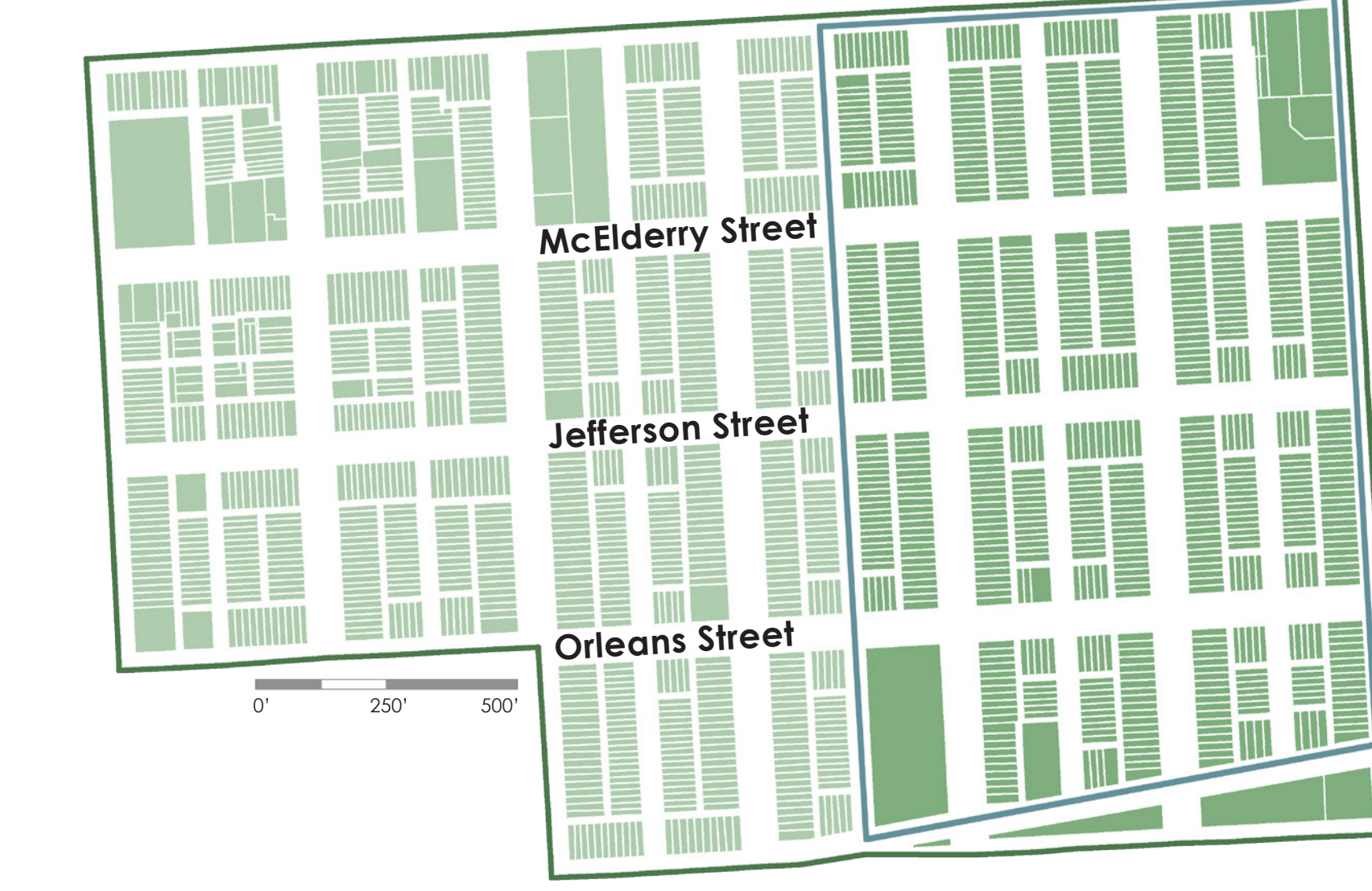
Icons Adapted from NounProject.com

TARGETED IMPLEMENTATION ZONES OF McELDERRY PARK WILLIAM PACA ELEMENTARY SCHOOL GREEN ROOF

BALTIMORE CITY LOCATOR + GREEN COVER

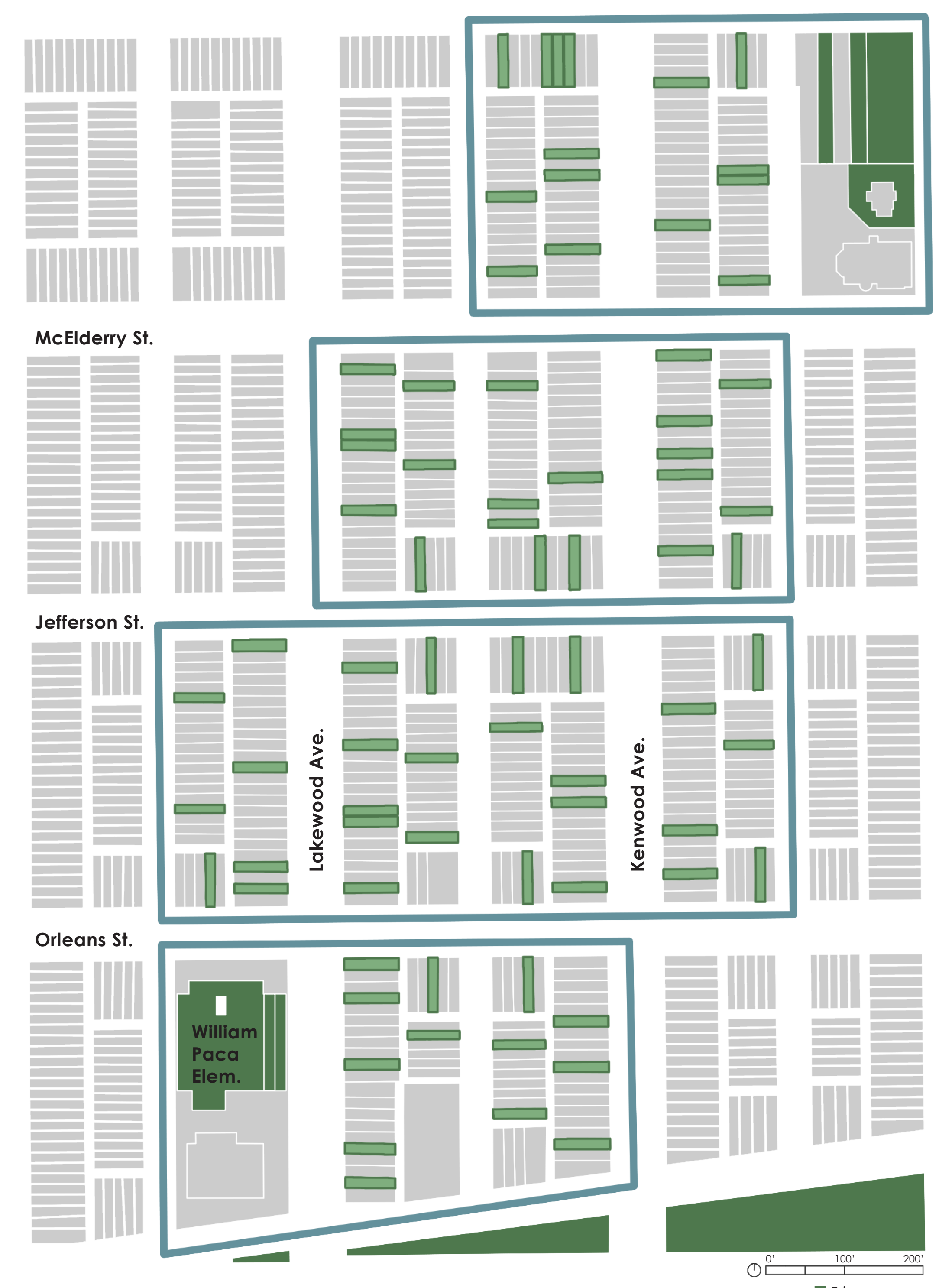


McELDERRY PARK LOCATOR



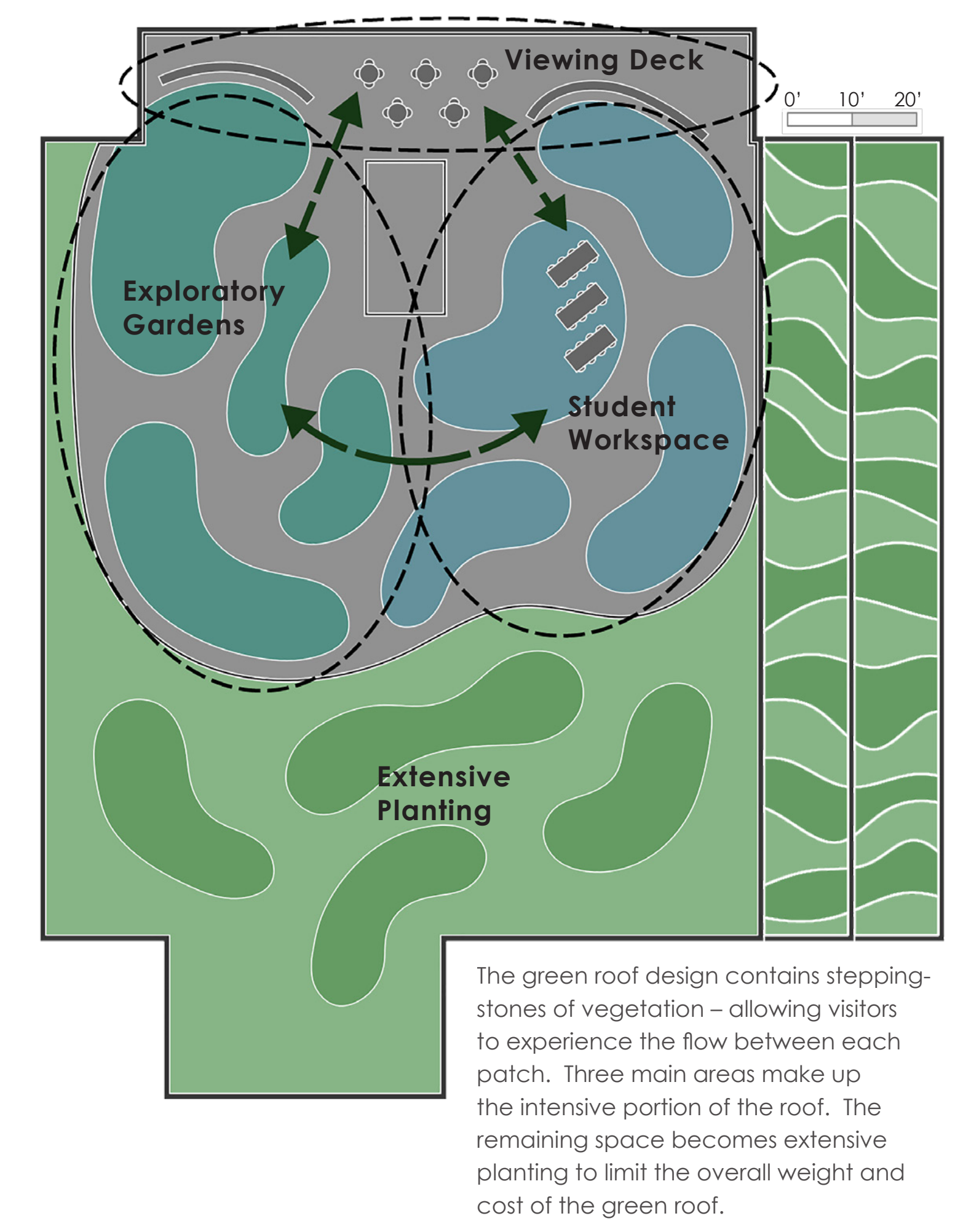
In McElderry Park, an entire landscape of impermeable rooftops, nearly untouched, offers an incredible opportunity for green revitalization. Efforts will be focused on the eastern half of the neighborhood, between Glover St. and Linwood Ave. This portion of the neighborhood is outlined above in blue.

TARGETED IMPLEMENTATION



Targeting a conversion of about 10-20% of McElderry's roofs would materialize to approximately 10 or 15 green roofs per city block. Additionally, William Paca Elementary School (located at the corner of Lakewood Ave. and Orleans Street) offers a space for major wildlife habitat and student education. Various green roof options are available, depending on structural and financial viability. The scattered, patchy arrangement of these new roofs creates the stepping-stone appearance and connection.

WILLIAM PACA ELEMENTARY SCHOOL GREEN ROOF

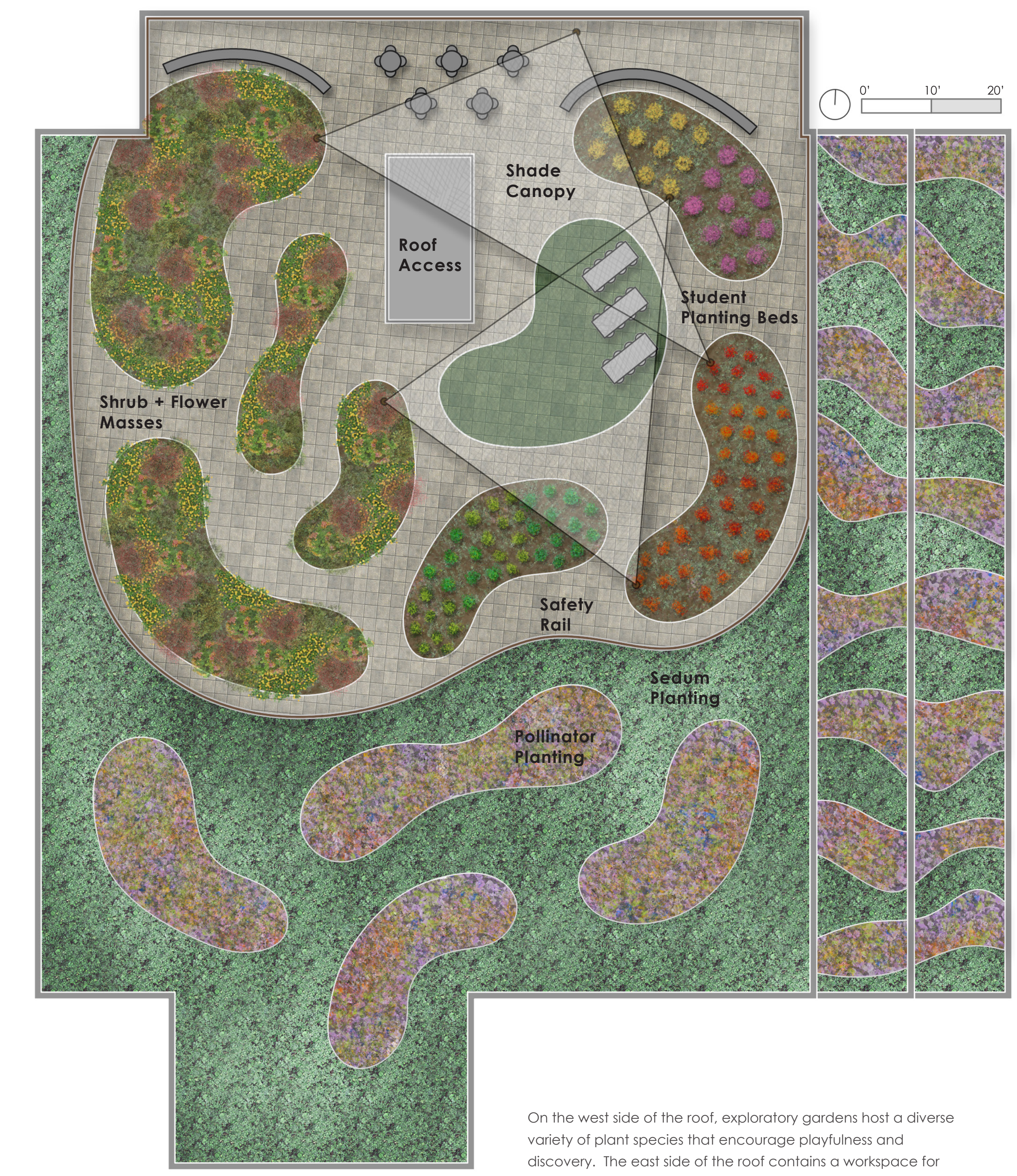


EDUCATIONAL WORKSPACE



This workspace enables students to learn about their role in the future health of the planet and allows for hands-on lessons in chemistry, biology, and nutrition. This aligns with the Baltimore Ecosystem Study's efforts of education and outreach - improving schoolyards and providing access to the environment for all children. Not only does an elementary school green roof answer this need, but it also meets the BES standards of sustainability and adaptability.

GREEN ROOF DESIGN



William Paca Elementary School is a leading prospect for the implementation of an intensive green roof. With nearly 28,000 square feet of flat rooftop, a green roof in this location would offer great educational opportunities in addition to the ecological benefits.

On the west side of the roof, exploratory gardens host a diverse variety of plant species that encourage playfulness and discovery. The east side of the roof contains a workspace for outdoor lessons and experimental planting by the students. The northern edge of the roof allows for casual seating and lookout views over the neighborhood. These interior spaces receive partial coverage from the shade canopies above. The southern third of the roof is restricted from pedestrians, but provides sedum and pollinator cover for wildlife habitat and stormwater mitigation.

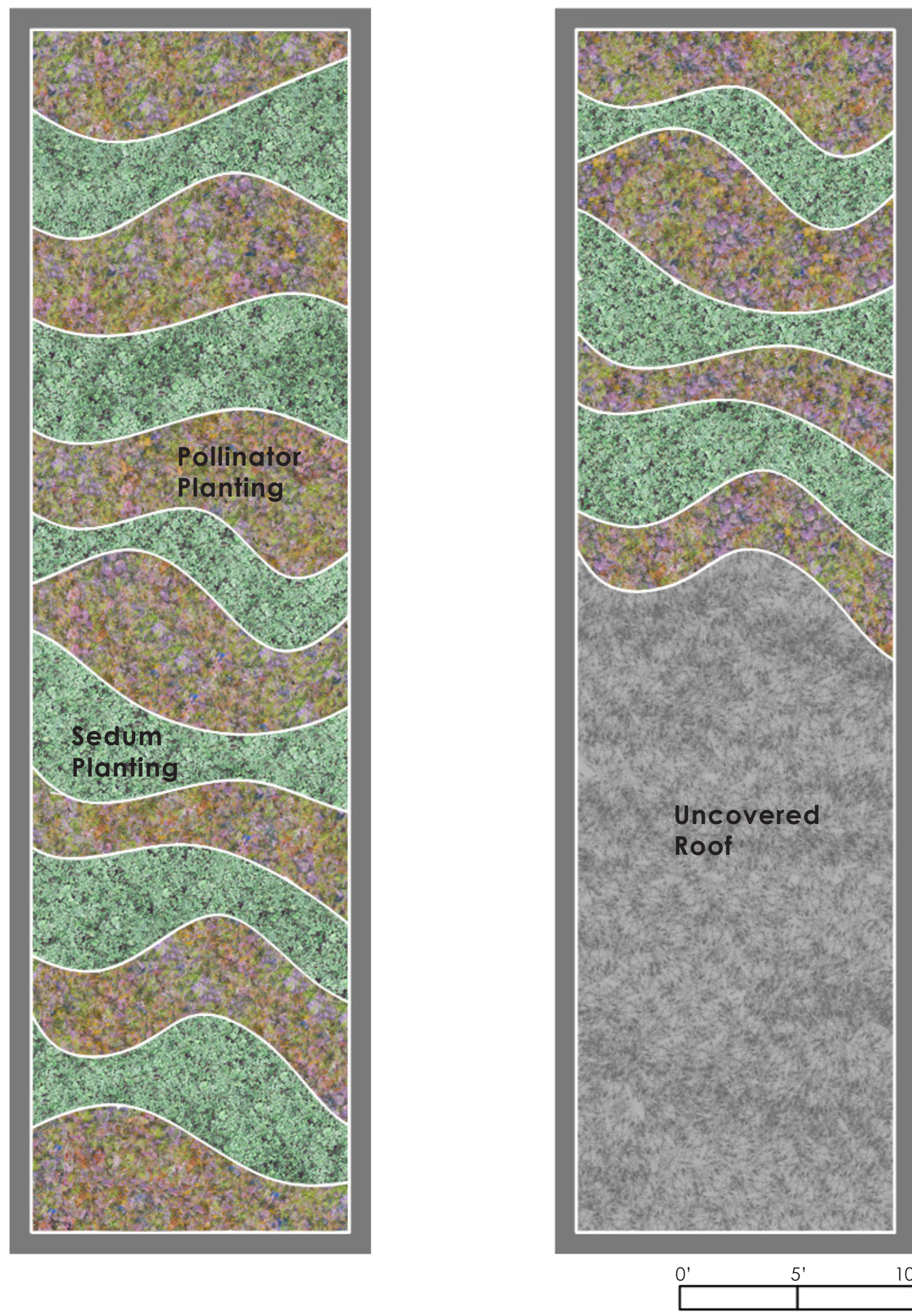
WILLIAM PACA ELEMENTARY SCHOOL - GREEN ROOF SECTION CUT



Keaton Lindberg, LArch 414 - BES Spring 2017

ROWHOUSE GREEN ROOFS

ROWHOUSE ROOF TYPOLOGIES



Due to weight restrictions of roofs and overall cost, extensive designs are the supreme answer for the rowhouses of McElderry Park. The rowhouse roofs in this area range in size, but McElderry's average roof is about 700 square feet. Two primary typologies are offered, depending on the viability of the roof.

These designs serve as a template for future implementation around Baltimore and other urban environments. Most modern structures can safely hold the soil and plants without any additional support. In the case of structural problems, partial vegetation cover is available.

NETWORK PLANTING PALETTE

Common Name (Scientific Name)	SPRING	SUMMER	FALL	Habitat
POLLINATOR PERENNIALS				
Red Milkweed (<i>Asclepias lanceolata</i>)				Butterflies
Rayless Goldenrod (<i>Bigelovia nudata</i>)				Butterflies
Gray Rosemary (<i>Corradina canescens</i>)				Butterflies
Pool Coreopsis (<i>Careopsis falcata</i>)				Butterflies
Showy Aster (<i>Eurybia spectabilis</i>)				Butterflies
Narrowleaf Sunflower (<i>Helianthus angustifolius</i>)				Butterflies
Scarlet Hibiscus (<i>Hibiscus coccineus</i>)				Butterflies
Coastal Plain Dwarf Iris (<i>Iris verna</i> var. <i>verna</i>)				Butterflies
Southern Blueflag (<i>Iris virginica</i>)				Butterflies, Beetles
Elegant Blazing-star (<i>Liatris elegans</i>)				Butterflies
Smooth Meadow-beauty (<i>Rhexia affinis</i>)				Butterflies
Atamasco Lily (<i>Zephyranthes atamasco</i>)				Butterflies
POLLINATOR SHRUBS				
Georgia Savory (<i>Clinopodium georgianum</i>)				Butterflies
Fothergilla (<i>Fothergilla gardenii</i>)				Butterflies
Virginia Sweetspire (<i>Itea virginica</i>)				Butterflies
Coastal Azalea (<i>Rhododendron atlanticum</i>)				Butterflies
Creeping Blueberry (<i>Vaccinium crassifolium</i>)				Butterflies
POLLINATOR VINES (GREEN WALLS)				
Climbing Aster (<i>Ampelaster carolinianus</i>)				Butterflies
Marth Clematis (<i>Clematis crispa</i>)				Butterflies
Swamp Jessamine (<i>Gelsemium rankinii</i>)				Butterflies
Arrowleaf Morning Glory (<i>Ipomoea sagittata</i>)				Butterflies
SEDUM SUCCULENTS (EXTENSIVE ROOFS)				
Gold Sedum / Stonecrop (<i>Sedum kamtschaticum</i>)				Butterflies
White Stonecrop (<i>Sedum album</i>)				Butterflies
Widow's Cross (<i>Sedum pulchellum</i>)				Butterflies
Two-Row Stonecrop (<i>Sedum spurium</i>)				Butterflies

Since extensive roofs are not usually accessible by people, concentration is placed on the environmental benefits. The combination of sedum and pollinator species will allow for the most successful results. These are the lightest and cheapest plants for an extensive roof. Sedum acts as a sponge to help manage stormwater. Pollinator plants create a new stepping-stone habitat between larger plots of green space.

GREEN WALL TECHNOLOGY

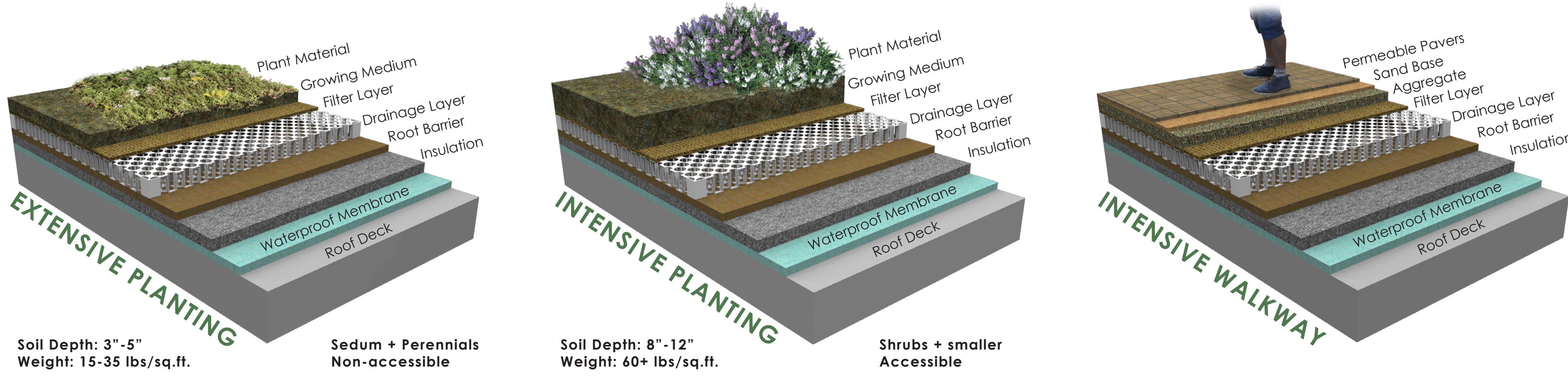
GREEN WALL PATCHWORK



Green walls will be implemented on the exterior walls of corner units within the focus area. Using mounted trellis structures and climbing vines, irregular vine growth continues the patchy organization of the stepping-stone network. For units that also possess a green roof, a continuous flow of vegetation is established from the top of the rowhouse and directly over the side. This provides a number of environmental and economic benefits.

GREEN ROOF CONSTRUCTION DETAILS

ROOF MATERIAL LAYERS



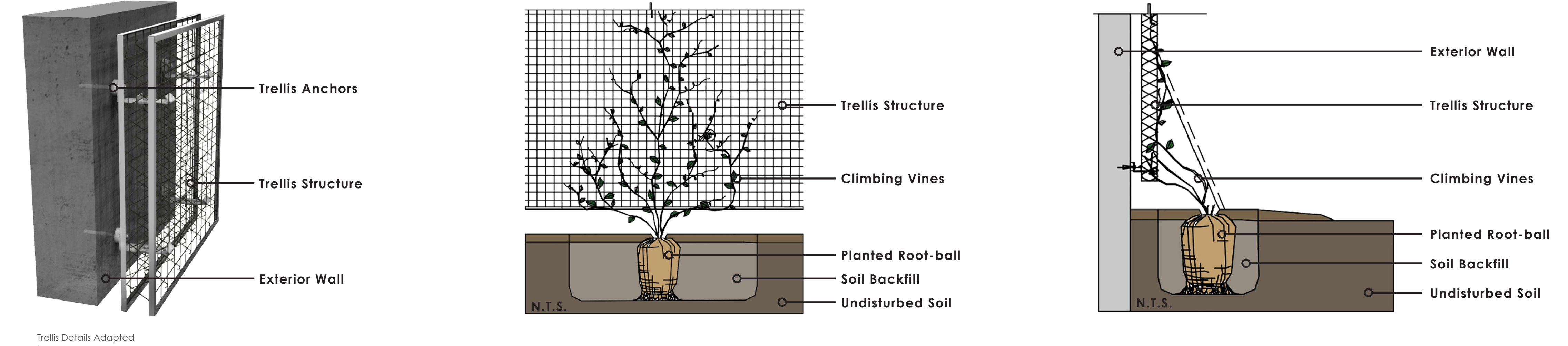
EXTENSIVE PLANTING
Soil Depth: 3"-5"
Weight: 15-35 lbs/sq.ft.
Sedum + Perennials
Non-accessible

INTENSIVE PLANTING
Soil Depth: 8"-12"
Weight: 60+ lbs/sq.ft.
Shrubs + smaller
Accessible

INTENSIVE WALKWAY
Permeable Pavers
Sand Base
Aggregate
Filter Layer
Drainage Layer
Roof Barrier
Insulation
Waterproof Membrane
Roof Deck

GREEN WALL CONSTRUCTION DETAILS

TRELLIS ATTACHMENT AND PLANTING METHOD



Trellis Details Adapted from Greenscreen.com

PEDESTRIAN VIEW



This perspective shows a pedestrian's view in the neighborhood. Ultimately, three levels of vegetation are established. Green roofs obviously sit the highest in the air and help to make a habitat link for birds and insects moving from one area of Baltimore to the other. Vertical green walls transition the roof vegetation down to the ground surface. Piggybacking on TreeBaltimore's plans, street trees are planted to create a canopy over the neighborhood sidewalks. This will offer a more consistent and fluid connection for wildlife.

Base Image: Google Maps

STEPPING-STONE NETWORK



This perspective shows the aerial view of a neighborhood block. As you can see, the patchwork of green roofs, green walls, and street trees create a stepping-stone network that greatly benefits the environmental and societal well-being of McElderry Park.

Base Image: Google Maps

IMPLEMENTATION RESULTS

