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Porchscapes: between neighborhood watershed and home

Community Design Center

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PORCHSCAPES
between neighborhood watershed and home

a project for Heritage Meadows, a Habitat for Humanity neighborhood in Fayetteville, Arkansas
06. Introduction: Botanizing the Street

14. Shared Street to Open Space

24. Lawn to Shared Street

58. House to Porch
introduction 

botanizing the street

Solving for Affordability, the Environment, and Social Capital

This 43-unit Habitat for Humanity residential project is a pilot LEED-Neighborhood Development (LEED-ND) to be built for $60/sq ft plus infrastructure costs. The objective is to design a demonstration project that combines affordability with best environmental practices as designated by the U.S. Green Building Council. Porchscapes is a Low Impact Development (LID) project funded under the U.S. Environmental Protection Agency’s Section 319 Program for Nonpoint Source Pollution. The project introduces the “shared street” as a green infrastructure to amplify ecological services delivered by site planning. Inspired by the robust social life defining the Dutch “living street” or woonerf, shared streets are designed as parks, combining pedestrian gathering spaces, parking, landscape systems, and stormwater facilities with traffic throughways. The primary goal is to provide an affordable, high-value, 10-acre housing development from modest one-story structures on a greenfield site. A complementary policy goal involves barrier busting: mainstreaming LID technology (illegal in most cities) in place of conventional pipe-and-pond stormwater management solutions.

“Up to 47 percent of surface pollutants can be removed in the first 15 minutes of a storm event, including pesticides, fertilizers and biologically derived materials and litter... Providing pervious surfaces that capture stormwater runoff increases opportunities for pollutant removal and attenuation of flow velocity.”

Green Streets: Innovative Solutions for Stormwater and Stream Crossings

1. crushed stone: provides a permeable surface, which aids in filtration of stormwater
2. porous asphalt: donated material, provides permeable surface aiding in storage and recharge
3. grasscrete: permeable surface with facultative vegetation aids in sediment control and recharge capacity
4. rubber sidewalks: recycled pervious material allows for infiltration with higher performance for play and pedestrian use
5. bioswales: facultative vegetation aids in phytoremediation and pollutant removal—“right plant, right place”
6. wet meadow: infiltration basin provides a 100% reduction in load discharge, velocity attenuation, infiltration, transpiration and high-quality habitat
7. treebox filter: used for natural sediment trapping and evapotranspiration

Maidencane Panicum Hemitomon
Rose Acacia Robinia Hispida
Little Bluestem Schizachyrium Scoparium

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6 7
An Affordable LEED-Neighborhood Development (LEED-ND)

Using LEED-ND as a planning platform, Porchscapes maximizes southern exposure—the optimum solar orientation in the southeast. Porchscapes increases density through small lot development and arranges each house to front a public green space. LID supports LEED-ND by incorporating hydrological processes that organize the neighborhood into subgroupings. LID is an ecological stormwater management approach with a basic principle modeled after nature: manage rainfall locally through a vegetated treatment train that keeps water on the site.

The goal of LID is to sustain a site’s predvelopment hydrologic regime by using techniques that infiltrate, filter, store, and evaporate runoff close to its source. Instead of using conventional civil-engineered “pipe and pond” solutions serviced by pipes, gutters, and catch basins, LID addresses runoff management with treatment landscapes distributed throughout the project—Parks, Not Pipes. Pipes simply transport polluted water elsewhere. A contiguous network of rainwater gardens, bioswales, infiltration trenches, sediment filter strips, tree box filters, and wet meadows will clean water using biological processes. This is critical since the first hour of urban stormwater runoff has a pollution index much higher than that of raw sewage. Thus, neighborhood sectors are developed as subwatersheds, combining hydrologic performance with open space design.

The Green Neighborhood Transect: Integrating Urban and Ecological Services

Planning begins with a Green Neighborhood Transect, leveraging urban and ecological services in the house, porch, yard, street, and open space, which ensures synergies among the five components. Conventional residential development separates horizontal infrastructural planning from individual property development, which are financed autonomously, creating subdivisions rather than neighborhoods. Porch aggregations delineate macro and microscaled landscape systems in neighborhood subwatersheds while expanding interior home space. The transect features the shared street as a primary neighborhood armature, amplifying social and environmental capital with lower construction and operation costs. Since stormwater management is the single greatest infrastructural expense, the soft engineering of shared streets facilitates a 40% savings in construction costs compared to conventionallyengineered streets.
The Shared Street: From a Traffic World to a Social World

Streets are designed as multipurpose landscapes to calm vehicular traffic, provide LID management functions, and reclaim social functions lost to the automobile’s dominance. Modeled after the Dutch woonerfs, shared streets have a remarkable record of safety where they are implemented. Streets are key components of the stormwater runoff treatment train, incorporating bioswales, sediment filters, and infiltration trenches. This eliminates costly curbs, gutters, pipes, and catch basins in conventional civil-engineered systems, which often flood at a 50-year event. Streets and attending green spaces are recombined as a treatment network to create “productive park” spaces, sponsoring active passive and active recreation. Since coverage of more than 30% of the site by hard surfaces for walks, roads, and roofs leads to irreversible water shed degradation, pervious surfaces for parking and walking are used in place of asphalt. The site is essentially designed to function like a sponge, recharging and evapotranspiring treated runoff after its initial absorption during a storm event.

Shared streets deliver numerous social services (e.g., traffic safety, recreation, aesthetics, crime prevention, conviviality) and, unlike conventional streets, do not constitute an environmental liability. The street becomes a net producer of ecological and urban services. Solving for such multiple bottom lines represents the next frontier of housing affordability: regenerative neighborhood infrastructure. Since individual property value is contextually created through collective environmental and social forces, neighborhood infrastructure is the key to sustained homeownership. What better way is there to leverage the investment of low-income home owners and ensure the same rate of equity appreciation enjoyed in other market grades of housing?
stormwater facilities menu

WELL-POORLY DRAINED

1. Smooth Alder
   2. Maidencane
   3. Roughleaf Dogwood
   4. Elderberry
   5. Groundsel-Tree

WELL DRAINED

6. Beautyberry
   7. Deciduous Holly
   8. Lanceleaf Buckorn
   9. Witch-hazel

WELL-EXCESSIVELY DRAINED

10. Rose Acacia
    11. Hawthorn
    12. Smooth Sumac
    13. Big Bluestem

Mechanical Pre-treatment Treatment

1. Underground Storage
2. Detention Pond
3. Pervious Paving
4. Tree Box Filter
5. Filter Strip
6. Infiltration Trench
7. Bioswale
8. Infiltration Basin
9. LEED-ND wetland buffer
serving as a catchment for 50% of the offsite water, the autocourt collects and filters runoff from surrounding houses.

located in a wetland buffer, the organic gardens and pond provide a viable flood retention area.
open space + porches
open space + porches + houses
Evapotranspiration 40%
Recharge 60%

A. Autocourt
  Pages 38-53

B. Community Gardens
  Pages 36-41

C. North Shared Street Plaza
  Pages 42-47

D. Mews Court
  Pages 48-53

E. South Shared Street Plaza
  Pages 54-59

Evapotranspiration 40%
Recharge 60%
Porchscape's low impact development solution

1. Infiltration zone
2. Constructed stream
3. Bioswale
4. Conserved wet meadow

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120 acres off-site input

5. Agricultural pond
6. Reclaimed detention pond
7. Existing conveyance swale and easement
8. Curb gutter-pipe

Porchscape’s low impact development solution

conventional pipe-and-pond solution
Traffic is more a social problem than an engineering problem. “If you want motorist to behave as if they are in a village, then build a village.”

-Hans Monderman, Dutch traffic engineer

crushed stone 1
biowall 2
grasscrete 3
rubber sidewalk 4
lawn/ play area 5
stained concrete 6

autocourt subwatershed
In transitioning from a traffic world to a social world, public right-of-ways may sponsor the emergence of new and viable neighborhood economies.

community gardens subwatershed
© north shared street plaza subwatershed
Three factors in the street environment cause motorists to slow down: intrigue, uncertainty, and humor. “The more neighborhoods that build the social life of their street, the greater the uncertainty that is created in the motorists mind even when there is no social activity in the streets.”

-David Engwicht, Mental Speed Bumps: The Smarter Way to Tame Traffic

north shared street plaza subwatershed

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“The same principles that make a great room make a great street.”

-David Engwicht, Mental Speed Bumps: The Smarter Way to Tame Traffic

mews court subwatershed

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“Traffic in residential streets is governed, to a large extent, by the degree to which residents have psychologically retreated from their street.”

-David Engwicht, *Mental Speed Bumps: The Smarter Way to Tame Traffic*

south shared street plaza subwatershed
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solar umbrella
living wall
patio
green wall
screen porch
standard Habitat Unit

the rubberneck
the "L"
the monoslope
the infill
frontage fabric
green wall
screen porch
standard Habitat Unit

geothermal (all types)
the infill
1150 Square Feet
the “L”
1150 Square Feet
the rubberneck
1250 Square Feet
MISSION
The mission of the University of Arkansas Community Design Center is to advance creative development in Arkansas through education, research, and design solutions that enhance the physical environment.

VISION
As an outreach center of the School of Architecture, UACDC is developing a repertoire of new design methodologies applicable to community development issues in Arkansas, with currency at the national level.

UACDC design solutions introduce a multiple bottom line, integrating social and environmental measures into economic development. Our recombinant design solutions add long-term value and offer collateral benefits related to sustained economic capacity, enhanced ecologies, and improved public health—the foundations of creative development.

APPROACH
Expanding the Consideration of Civic Space
The contemporary public domain has shifted to an expanded urban field that includes suburban and other non-urban environments—a geography of sprawl. Compounded by the decline of traditional downtowns, this shift poses new planning challenges for which no adequate civic development models exist.

Our planning approaches are tailored for historic downtowns, rural sites, watersheds, highway/rail infrastructure, the college campus, retail environments, and the office/residential/retail subdivision.

Developing New Models of Design
Through meta-disciplinary research and design principles, UACDC recombines ecological, architectural, landscape architectural, and urban design solutions to address emerging planning challenges. Our research maps the unique economic, political, and cultural processes that have shaped the Arkansas landscape.

Our work addresses new challenges in affordable housing, urban sprawl, environmental planning, and management of regional growth or decline.

Constructing Discourse
Design professionals, educators, and students seeking civic design experience staff the UACDC. We collaborate with other agencies such as the Biological and Agricultural Engineering Department, the Center for Business and Economic Research, the Arkansas Natural Resources Commission, and the Arkansas Forestry Commission. Through work with our clients and collaborators, we initiate learning networks that facilitate creative development.

IMPACT
UACDC was founded in 1995 and has provided design and planning services to over 30 communities across Arkansas. Our planning has helped Arkansas communities to secure nearly $64 million in grant funding to enact suggested improvements.
Some rail transit projects have failed to meet their potential because they lack community-based design consideration, relying solely on transportation modeling. Many recent rail transit systems, once implemented, have experienced levels of ridership far beyond original projections and additional voter support for system extensions.