Community-Based Green Infrastructure in Arizona’s Public Rights-of-Way

James DeRoussel  RLA  Program Manager  Watershed Management Group
Mission:

WMG develops and implements community-based solutions to ensure the long-term prosperity of people and health of the environment. We provide people with the knowledge, skills, and resources for sustainable livelihoods.
PROGRAMS:

- Demonstration Sites
- Co-Op
- Schoolyard Program
- Green Streets
- Technical Trainings

International

Soil & Water Conservation
Sanitation
Green Streets – Green Neighborhoods

Goal:
Help cities improve environment & quality of life through integrated Green Infrastructure.

Method:
- Use GI to address disparate urban problems
- Build community leadership
- Empower residents with hands-on skills and education
- Develop technical and educational resources

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What is Green Infrastructure?

- Low Impact Development (LID)
- Integrated Water Management
- Water Sensitive Urban Design
- Best Management Practices for Stormwater Quality (BMP’s)

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What is Green Infrastructure?

- WMG: “constructed features that use living, natural systems to provide environmental services, such as capturing, cleaning and infiltrating stormwater; shading and cooling streets and buildings; and calming traffic.”

Photo: Dave Elkin, City of Portland

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What is Green Infrastructure?

• Bioretention
• Traffic Chicanes
• Green Roofs
• Stormwater BMPs
• Permeable Paving
• Preservation of Natural Systems

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Who designs Green Infrastructure?

- Engineers
- Landscape Architects
- Architects
- Urban Planners
- Policy Makers
- Developers
- Contractors

What about?

- Maintenance staff
- Residents and neighbors
- Business owners

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Why Green Infrastructure?

• Livability / Quality of Life
  • Shade
  • Traffic calming
  • Property values
  • Crime reduction
  • Community building

• Environmental Benefits
  • Water quality
  • Air quality
  • Flooding
  • Urban heat island
  • Wildlife habitat

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Flooding
Non-point source pollution
Urban Heat Island
Limited water resources
Functional Goals of Green Infrastructure

• Harvest Storm Water
• Increase Infiltration and Recharge
• Prevent Flooding
• Create Shade/Reduce Urban Heat Island
• Increase Water and Air Quality
• Decrease up-front and lifetime project costs
Bioretention & Water Quality

- Sedimentation
- Filtration
- Adsorption
- Uptake
- Microbial activity
- Volatilization
Gray Infrastructure vs. Green Infrastructure

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Gray Infrastructure

Alters pre-development hydrology:

- Increased runoff
- Remote, large scale retention/detention results in high maintenance and wasted space
- Decreased infiltration
- Downstream flooding
- Erosion/Sedimentation

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Green Infrastructure

Mimics pre-development hydrology:

• Local micro-retention

• Decreases runoff

• Increased infiltration and local soil moisture

• Reduced downstream flooding and erosion

• Reduced burden on public storm water systems

[Photo Credit: Rainwater Harvesting for Drylands and Beyond, Lancaster]

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  - Air quality
  - Flooding
  - Urban heat island
  - Wildlife habitat

- Economic Benefits
  - Reduce energy consumption
  - Extend life of infrastructure
  - Reduce cost of new construction

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Costs of Green Infrastructure

Retrofitting:
• G.I. retrofitting slightly more costly than rehabilitating of conventional infrastructure
• G.I. retrofitted incrementally can spread cost over long period of time
• Savings realized in long term operation and maintenance

New Construction:
• G.I. often 10-20% less costly than conventional infrastructure
• G.I. less costly in lifetime operation and maintenance
• Secondary and ‘trickle up’ economic benefits

Redevelopment = Opportunity

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Source: Natural Resources Defense Council
Tools for Green Infrastructure

Curb Cuts

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Tools for Green Infrastructure

Curb Cores

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Tools for Green Infrastructure

Chicanes

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Tools for Green Infrastructure

Street-width reduction

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Tools for Green Infrastructure

Traffic Circles

[Diagram of a traffic circle with labels for various components such as Manhole access, Rock Slope, Tree Planting Shelf, Rip Rap, and Small native tree.]

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Case Studies Across Arizona

- Palo Verde Neighborhood (Tucson)
- Burns Residence (Tucson)
- Fry Boulevard (Sierra Vista)
- Lake Havasu City Aquatic Center
- Primera Iglesia (Phoenix)

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Palo Verde Neighborhood
Tucson, AZ

- Client/Project Owner: Private homeowners
- Funding: Private
Palo Verde Neighborhood
Tucson, AZ

- Public right-of-way
- Mid-town Tucson

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Palo Verde Neighborhood
Tucson, AZ
Palo Verde Neighborhood
Tucson, AZ

NOTES:
1. CURB CORES MUST HAVE A MINIMUM OF 5' SEPARATION.
2. CURB CORES MUST BE A MINIMUM OF 5' FROM DRIVEWAY APRON.
3. CURB CORES MUST BE A MINIMUM OF 20' FROM ALL CORNERS & A MINIMUM OF 50' BACK OF CORNERS WITH STOP SIGNS.

1 COT DOT STANDARD DETAIL
WATER HARVESTING CURB CORING DETAIL
City of Tucson requires maintenance agreements from property owners for GI within the public right-of-way.
Palo Verde Neighborhood
Tucson, AZ
Palo Verde Neighborhood
Tucson, AZ

Before

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Palo Verde Neighborhood
Tucson, AZ

After

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Burns Residence
Tucson, AZ

- Client/Project Owner: Private homeowner
- Funding: Private/ADEQ Grant Subsidy

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Burns Residence
Tucson, AZ

Before
Burns Residence
Tucson, AZ

During – Contractor Excavation
Burns Residence
Tucson, AZ

During – Volunteer Workshop (fine grading, rip-rap, planting)
Burns Residence
Tucson, AZ

During – Volunteer Workshop (mulch, cleanup)

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Burns Residence
Tucson, AZ

After

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Burns Residence
Tucson, AZ

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Client/Project Owner:
City of Sierra Vista

Funding:
Walton Family Foundation
Fry Blvd.
Sierra Vista, AZ
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Sierra Vista, AZ

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Aquatic Center
Parking Lot

Lake Havasu City, AZ

• Client/Project Owner:
  Lake Havasu City, Public Works
• Funding:
  ADEQ Water Quality Grant for Green Infrastructure
Lake Havasu impacted by urban runoff, sedimentation and reduced water quality
• Heavily trafficked parking lot drains directly to Pima Wash, Lake Havasu
STORMWATER CALCULATIONS

EXISTING PARCELS LOT:

1. PERVIOUS VEHICULAR AREA = 4,456,585 SQ. FT.
   - 45,000 SQ. FT. X 1 RAAN X 7 RAAN = 30,000 GALLONS PER 1 RAAN

2. LANDSCAPE ISLANDS AND PATIO = 10,000 SQ. FT.
   - 6,000 SQ. FT. X 1 RAAN X 7 RAAN = 42,000 GALLONS PER 1 RAAN
   - 4,000 SQ. FT. X 1 RAAN X 7 RAAN = 28,000 GALLONS PER 1 RAAN

TOTAL STORMWATER RUNOFF = 73,000 GALLONS PER 1 RAAN

*Does not include stormwater contributions from surrounding buildings and adjacent landscape.*

EXISTING CONDITIONS
STORMWATER CALCULATIONS

EXISTING PLAINS LILAC:

- PAVED WOODED AREA = 4,100 SQ. FT.
  4,100 SQ. FT. X 0.18 GALLONS PER SQ. FT. X 0.8 = 674 GALLONS

- LANDSCAPE MEDIAN AND ISLANDS = 1,605 SQ. FT.
  1,605 SQ. FT. X 0.14 GALLONS PER SQ. FT. X 0.8 = 186 GALLONS

TOTAL STORMWATER RUNOFF = 860 GALLONS PER FT. RAIN

DOES NOT INCLUDE STORMWATER CONTRIBUTED FROM SURROUNDING BUILDINGS AND URBAN LANDSCAPE.

PROPOSED IMPROVEMENTS:

- AREA A WATER HARVESTING BASIN = 1,475 CU. FT. (14 FT. DEPTH)
  1,475 CU. FT. X 0.74 GALLONS PER CU. FT. X 0.8 = 798 GALLONS

- AREA B WATER HARVESTING BASIN = 1,680 CU. FT. (16 FT. DEPTH)
  1,680 CU. FT. X 0.74 GALLONS PER CU. FT. X 0.8 = 1,110 GALLONS

TOTAL STORMWATER RETENTION = 1,908 GALLONS

DOES NOT ACCOUNT FOR IMPACT ON STORMWATER DUE TO SOIL INFILTRATION.

PLANTING SCHEDULE

<table>
<thead>
<tr>
<th>PLANTING SCHEDULE</th>
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<tbody>
<tr>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>SHRUBS</td>
</tr>
<tr>
<td>PLANTS</td>
</tr>
<tr>
<td>TREE BARK</td>
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</tbody>
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PLANTING PLAN

SCALE: 1" = 10"
Aquatic Center
Parking Lot
Lake Havasu City, AZ

- Asphalt cut and removed
- Flush curb and wheels stops

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Aquatic Center Parking Lot

Lake Havasu City, AZ

- Native grasses and trees
- Crushed rock mulch

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Aquatic Center Parking Lot

Lake Havasu City, AZ

- Six months post-construction

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Aquatic Center
Parking Lot
Lake Havasu City, AZ

- Concrete channel drains parking lot to Pima Wash at bottom end
• Concrete channel removed and replaced with bio-retention basin
Concrete channel removed and replaced with bio-retention basin, planted with native grasses and trees, armored with rock
Aquatic Center Parking Lot

Lake Havasu City, AZ

- Six months post-construction
Aquatic Center
Parking Lot
Lake Havasu
City, AZ

www.watershedmg.org
• Client/Project Owner: Primera Iglesia Methodist Church
• Funding: ADEQ Water Quality Grant for Green Infrastructure
Primera Iglesia
Phoenix, AZ

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Primera Iglesia
Phoenix, AZ

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Primera Iglesia
Phoenix, AZ

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Central Park’s Oasis Project
at Primera Iglesia Metodista Unida

Join one of these hands-on workshops to get involved!

Friday, October 21
8:00 AM – 1:00 PM

Saturday, October 22
8:00 AM – 1:00 PM

We will:
• Create earthen water harvesting features
• Plant native trees, shrubs and wildflowers
• Learn about sustainable landscaping techniques

The Oasis Project will harvest rainwater from streets and rooftops in order to:
• grow native shade trees & desert plants
• create habitat
• beautify streets and yards
• build community

Del Parque Central
Proyecto Oasis
la Primera Iglesia Metodista Unida

Unite a una de estos talleres prácticos para involucrarte!

Viernes, Octubre 21
8:00 AM – 1:00 PM

Sábado, Octubre 22
8:00 AM – 1:00 PM

Nosotros:
• Crear sistemas de cosecha agua con tierra
• Plantar árboles nativos, arbustos y flores silvestres
• Aprende de técnicas sostenibles de arquitectura paisaje

El Proyecto Oasis cosechará agua de lluvia de calles y techos para:
• Crecer sombra nativa de árboles y plantas desérticas
• Crear hábitat
• Enlumecer calles y patios
• Construir comunidad

All workshops will take place at Primera Iglesia Metodista Unida, 701 S. 1st St. To sign up or for more information, contact Tony Syracuse, 520-396-3266 or tsyracuse@watershedmg.org.

Todos los talleres tomarán lugar en la Primera Iglesia Metodista Unida, 701 S. 1st St. Para apuntarse o para más información, contacte Joe Silins, 520-396-3266 or jsilins@watershedmg.org.
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Technical Training in Community-Based Green Infrastructure

March 15-16, 2013  Tucson, AZ

$120 Registration (before February 18)
$110 WMG Alumni/AzASLA

CEU’s available to ASLA

www.watershedmg.org
...thank you!

James DeRoussel RLA  
Program Manager  
Watershed Management Group  
520-396-3266  
jderoussel@watershedmg.org

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