Urban Roadways: A refreshing look at roadside projects

Carrie Tauscher
State Community and Urban Forestry Coordinator
ctauischer@dnr.in.gov
317-234-4386
Today

• General Consensus

• Case Studies
  – Program overview
  – Changed practice
  – Value

• Lessons learned
General Consensus

• Road Projects are focused on:
  – The Performance of the road surface
  – Traffic volume and flow
  – Safety
  – Budget

• Groups wanting plantings don’t always understand the constraints
How We Imagine **Existing** Trees in Construction Areas
THIS AREA PLANNED TO HAVE TREES INSTALLED
Texas DOT Roadside Forests

- Since 1998:
  - 1,546,142 Trees
  - 416,630 Shrubs
  - 585,252 Vines/Groundcover
  - 1,200+ ACRES Amended Soil

- TXDOT
- Zero maintenance of roadside forests
  - Establishment Contracted
Why Reforestation

• Main goals
  – AESTHETICS
  – Air Quality- harder to attain will smaller plantings
  – Work with all “tree” and Quality of life groups in the area. They see the value.
    • In turn they support DOT by contacting local elected officials at state and district levels .
And We Wonder Why Plants Struggle On Disturbed Sites?

INSTALLED 20 YEARS PRIOR TO PHOTO

How Do We Improve Conditions?
Life Cycle of Construction Soil
• Post-construction “dirt”
  – has the most favorable engineering qualities

• Organic matter in soil
  – conflicts with the engineering properties necessary to support a road bed or embankment
  – as do the soil pore spaces, which contain air and water

Everything plants need to survive is bad.
## Compare Soil/Dirt: Physical, Chemical and Biological Properties

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>40-55%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95-98%</td>
</tr>
<tr>
<td>1.1-1.4 g/cc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.5-2.0 g/cc</td>
</tr>
<tr>
<td>Adequate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Decreases</td>
</tr>
<tr>
<td>Present and active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Reduced</td>
</tr>
<tr>
<td>35%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Reduced or absent</td>
</tr>
<tr>
<td>15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Reduced</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Very reduced</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Altered</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Reduced</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storm water Infiltration ↓</td>
<td>Storm water Runoff ↑</td>
<td>Water-holding Capacity ↓</td>
<td>Available Water ↓</td>
<td>Available Nutrients ↓</td>
<td>pH</td>
<td>Electrical conductivity ↓</td>
<td>Cation Exchange Capacity ↓</td>
<td>Rooting Penetration</td>
<td>Resistant</td>
</tr>
</tbody>
</table>

TTI. Synthesis of New Methods for Sustainable Roadside Landscapes.
TxDOT. Guide to Roadside Vegetation Establishment.
What about salvaged/purchased topsoil?

- Assumes good topsoil exists.
- Assumes storage locations exist.
- Difficult to manage stockpile when soil is needed to change road grade and add retaining walls.
- True topsoil not available in large quantity.
- Trucking costs.
Adjusted Approach to meet Goal

**LANDSCAPE MODELS**

**OLD**

- **Regular Inputs**
  - Mechanical Energy
  - Expose Plant to Soil, Environment

**NEW**

- Develop Environment which can handle exposures
- One input
How could TxDOT have a conversation regarding urban landscape soils?

1,200+ ACRES amended soil

Tremendous opportunities:

• Explore methods and procedures
• Test materials
• Monitor growth and mortality
• Address long term management concerns
• Test designs in various site conditions
• Balance expectations with resources
• Manage partners and multi-disciplinary design teams
Why Does It Matter?

MATTER VS. MATERIAL

- Organic **material**: anything that was alive and is now in the soil (mulch, compost, leaves, etc.)
- Microorganisms convert organic **material** into **matter** by cycling compounds into the soil.
It takes A LOT of organic material to increase organic matter content.
Adding compost: compensates for lack of nutrient cycling. Future leaf drop sustains nutrient cycling.
Concepts for Improving Dirt to Soil

- Managing soil.
- Natural organics feed soil.
- Synthetic fertilizers feed plant.
- Nutrient source: organic matter (leaves, fertilizer).
- Forest landscapes are self fertilized.
- Urban landscapes often don’t receive leaf litter.
- Natural organics are like an insurance policy. The soil biology and plant will perform necessary chemistry for plant nutrition.
AMENDED AREAS READY FOR PLANTING
Over 12,000 trees at this interchange.
Spec it!

- All soil treatments installation and initial maintenance contracted
- All naturally-derived or certified organic (third party, OMRI, etc) Fertilizers, amendments, compost/tea/extract
- **Inspection/approval/quality**
- Industry has grown
Specification focus changed to root zone.

“Plus $600 for delivery.”
Specification focus changed to root zone.

"Plus $600 for delivery."
Minnesota DOT Landscape Partnership Program

• Evolved predominantly into a Community Entrance program
  – Design work by Dot or outside design approved by dot
  – Participation is first come first served
  – Reimbursement for plant material
  – labor and or equipment on city/org.
  – Cooperative agreement required
Goals

(1) Roadside beautification
(2) Community improvement
(3) Environmental stewardship
Since Establishment

• 330 projects
• $7 million in landscaping improvements
  • <1/3 in State Highway Funds
• Cost savings of nearly $1.75 million in maintenance
• 60 national and state awards.
How its Funded

- Funding out of District maintenance budget
  - Districts set aside $40,000 each.
  - Metro districts are investing $150,000
    - Participation varies, usually in spurts.
  - Some years districts only spend $10,000
The Average Project

- Community population: 300-5,000
- DOT completes or approves design
- Municipality does site prep work
• 2-3 hr volunteer event or contracted install
• Municipal or volunteer org follow-up to complete project/ begin maintenance
• Some communities participate multiple times 5-7 yrs in a row
Delaware DOT
Roadside Vegetation Concept and Planning Manual

- Highway enhancement program
- Legislation lead development
- Systematized approach
  - Site evaluation
  - Landscape investment prioritization
  - Planting design and vegetation guidelines
Objectives

• Document DelDot Policies with respect to roadside vegetation modifications
• Define criteria to guide judgments in roadside design process
• Set forth the most current and effective design techniques and procedures
• Assure that safety, economic, aesthetic, and environmental quality factors are adequately considered in the design process
“Steep” slopes are considered for non turf vegetation to reduce maintenance and increase safety
Landscape Editing

• Selective removal to develop “ordered appearance”
• No planting cost
• Native ecotypes are conserved and calibrated
Periodic and Strip mowing

Mowing provides a clean and “orderly” edge while promoting diversity of species.

Helps discourage undesirable woody re-growth
Intersection design
Requirements

Figure 1. Four corner intersection

Legend
- Plantings must be 18” or less *
  Sight line

Figure 2. Intersection with channelization islands

Legend
- Plantings must be 18” or less *
  Sight line
- Plantings must be 18” or less **
  Sight line
- Taller plantings permissible

Figure 3. Ramp infield

Legend
- Plantings must be 18” or less *
  Taller plantings permissible

* Designer should consider vertical roadway geometry at intersection to determine maximum acceptable height.

** Designer should consult with maintenance staff to determine logistics and safety of plant installation in median locations.
Gateway Vegetation
My Lessons Learned

• It’s all about Public Relations
  – Build better community relationships & partners
  – Be clear about expectations
  – Set an attainable example in your region
    • It has been done and can be replicated
  – Environmentally better.
• Projects hold value
  – Aesthetic improvement
  – Lower maintenance
  – Lower plant mortality
  – Increase safety
  – Projects provide ecosystem services
• Pick the low hanging fruit

  – Work with partners who want to work with you

  – Implement new projects where contractors, communities, engineers are willing to try something new.

  – Try new ideas on non controversial projects first
Other consistencies

- Programs used containerized stock between 3 and 30 gal. Some used bare root stock
- All consider the site conditions ecological and cultural
Call for Change

• Consider the cost benefit of new practices.
• What proportion of your project is landscape cost?
• How can that best be used? Leveraged?
• Are we using the right tree(s) in the right locations?
• What can we do to improve Indiana's Communities, roadsides, landscape.