Supply Chain Logistics
Current Landscape & Trends That Will Impact Your Practice

Annual Meeting
Brooklyn Center, Minnesota
January 30, 2013

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Murphy Companies
www.murphywarehouse.com

Past Chair
Council of Supply Chain Management Professionals (CSCMP)
Center For Transportation Studies (CTS), U of MN
American Society of Landscape Architects – MN Chapter

Presentation Flow

• Supply Chain Logistics
  ✓ What is it?
  ✓ Why do we care about supply chain?
  ✓ Business Strategy Implications

• 5 Key Trends
  ✓ Fuel Pricing
  ✓ Truck & Rail Capacity
  ✓ Domestic Networks + New Mantra
  ✓ Global Sourcing + Near Sourcing
  ✓ Green / Sustainability in Logistics
Why Care About Supply Chain Logistics / Transportation

Touches Everything We Do

% of Economy

8.3% Logistics
$3.78 per person in U.S.

vs.

17.3% Healthcare
$7.89 per person in U.S.

Supply Chain Logistics
What Is It?

Definition:
“The care and movement of product from point of origin to the end consumer”

Range:

Raw Material → Processing / Manufacturing / Assembly → Distribution Logistics → Customer

↓

Return / Reverse Logistics

↓

Restock / Recycle / Disposal

Activities:
✓ Procurement / Sourcing
✓ Inventory Control
✓ Packaging
✓ Network Design
✓ Order Fulfillment
✓ Warehousing
✓ Transportation
✓ Returns / Recycling Mgmt.
Why Care About
Supply Chain Logistics / Transportation

Strategic Advantage - Supply Chain Execution

Apple iPod Global Supply Chain – leading edge technology would be wasted if time to market was too long!!!

Steve Jobs said supply chain was the key to Apple’s success…!!!

P&G’s success relies on this and so do many others

- Yes, the great ads, packaging, shelf designs, marketing, sales, etc. help….
- But if the product isn’t on the shelf when you want to buy - it doesn’t matter anymore

P&G’s Billion-Dollar Brands

When Leggatt took over, there were 16. Now 21 brands bring in annual revenue of $1 billion or more.
Fuel Prices
Will Stay High!
And Likely Go Up and Impact All Supply Chains

- Transportation Rates
- Sourcing Locations
- Domestic & Global Distribution Networks
- Product Development & Packaging Systems
- Inventory Levels and Demand Planning

Customer Expectations Will Be Impacted

Diesel Fuel Prices
We all know what happened in 2008, but notice March 2009 to April 2011:

+ $1.97..... + 94% in 24 Months
No One Seemed to Notice!

![U.S. No 2 Diesel Retail Prices (Dollars per Gallon)](image)
Trend - Fuel pricing

IMPACT: How far a Truck travels on $500 of Diesel Fuel

Start

January 25, 2013

Transport Capital Partners, LLC

Diesel fuel powers the supply chain sector

Logistics Leadership since 1904

Crude Oil Supply
Growing Global Demand

Asia is World’s Largest Petroleum User
China’s economy continues to consume more oil per year adding to world demand. India and other developing economies also need to be considered!

Logistics Leadership since 1904
Fuel Price Implications
Natural Gas for Trucks Growing
10 Years before major impact will be felt
Supply & Delivery Network

Fuel Price Implications
Transportation Mode Shifting
Mode Shifting to Occur More Frequently
Shippers moving down rungs to save money and reduce carbon footprint

Air → Ground
Air → Ocean
Intermodal → Boxcar
Truckload → Intermodal
LTL → Truckload
Rail → Barge
Trucking Industry

Capacity Reductions

Truck Driver Shortage: 300,000+

- Insurance does not allow drivers under age 25.
- Driver labor pool averages 5 years older than general labor pool; retirements will hurt industry.

National Media have discovered it...!!!
Why Do We Care About Truck Capacity Or Driver Shortage?
Freight Modal Shares
In Domestic Tonnage

Trucks Handle 70% of all Freight

Why Do We Care About Truck Capacity Or Driver Shortage?
Freight Modal Shares
In Domestic Tonnage

Trucks Handle 70% of all Freight

Trucking capacity issue will plague economy for years!
Railroads cannot meet all future demand for capacity
Will drive prices up... & shipping delays up...!!!

Capacit y Example MN
Driver Shortage & Lost Business
Impact on Minnesota Outstate Plants

- Rural manufacturing plants - traditionally cheap land & available labor pool a plus
- 2007 saw a major issue with truck availability in rural areas: went away during recession.
- Shippers forward positioned inventories to Twin Cities area for more access to trucks.
- 2013 current growing truck shortage will create another problem for outstate plants and access to trucks.
  - When driver unloads in Twin Cities they will choose a Twin City load vs. driving 100+ miles outstate to get next load. Merely economics at play.
- Outstate access to full & timely rail service also an issue.

Source: U.S. Freight Transportation Forecast to...2017

Source: 2009 Global "Giants of Shipping" transportation study, Karl Marrott, Ph.D. Georgia Southern University
Transportation Implications
Shifting Traffic Patterns
Tonnage on Highways, Railroads and Inland Waterways 2002


Will see western North Dakota show up soon with huge rail vol. from oil growth

2012 Status:
2400 Cars: ND to Okla wk'ly w crude oil
3-5 yrs: projected to grow to 4000 cars/wk
Inbound demand expected to reach 1500+ / wk in 2012

ND Truck demand already impacting Midwest availability

Rail Industry
Truck to Rail Conversion vs. Oil Prices

As fuel prices rise more convert to rail
Note direct correlation

Truck driver shortage also driving more to rail

**Rail Industry**

Rebirth and Major Growth

**Key Realities:**
- Energy efficient / lower emissions
- Lower cost, but longer lead-times
- Were near max capacity before recession...!!!
- Adding capacity very expensive: yet more than spending fair share on their assets

**Rail Congestion Leads To Slower Trains**

There is only so much demand that Rail can absorb & move on their corridors

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**Rail Industry**

Intermodal

**Fastest Growing Segment**

International vs. Domestic Containers

Note how domestic has overtaken international in volume

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*Capital spending plus maintenance expenses minus depreciation per mile of railroad. Data are for Class I railroads. Source: AAR.*
Rail Industry
Growing in Total
Intermodal Growing Even More
Growing to off-set diesel prices, truck shortage and congested seaports
May Require More Transfer Yards
✓ 1500+ miles: traditional focus
✓ 350+ miles: shorter target focus
✓ Short haul target is geared to compete for more truck traffic

Rail Industry
Rail Congestion Impacts
Productivity Plateau
Last 15 year period
Rail industry will not see a major productivity improvement till another "game changing" technology arrives

Shortage of Qualified Train Engineers & Other Personnel
Next 5 Years Critical
Typ. ex.: Canadian Pacific will lose to retirements 50% of current roster in 5 years!

[FIGURE 1] ANNUAL PRODUCTIVITY INDEX FOR THE U.S. RAIL INDUSTRY

[Trend – Truck / Rail Capacity]

[Logistics Leadership since 1904]
Logistics & Real Estate

New Mantra

“Location, Location, Logistics”

Old mantra was “location, location, location”

MN / Twin Cities is not the center of the existing logistics hubs!

Allot is happening around us...

Domestic Network Design

Where And How Many

Source: New Age of Trade. Cushman & Wakefield, 2009

Logistics Leadership since 1904
Domestic Network Design
Increase In Locations

Last 20 yrs trend - fewer & bigger warehouses: 3 - 5 Total
✓ JIT, ERP, TQM, Lean Impacts
✓ Lower fuel costs helped allowed

Today, attention given to increasing number of warehouses: 6-10 Locations Network
✓ Impact of higher local delivery cost (vs. long haul cost) is changing networks.
✓ Trend also towards smaller warehouses.

Source: New Age of Trade, Cushman & Wakefield, 2009

Domestic Network Design
Fuel Impacts, Congestion, etc. Pushing Towards More Locations

Local Delivery – Higher Cost
✓ Congestion!!!
✓ Less efficient time & fuel utilization
✓ Dock time: waiting & unloading / loading
✓ Hourly Cost (vs. fixed per mile)
✓ More safety incidents

Long Haul – Less Expensive in Comparison
✓ Less Congestion to fight
✓ Engines running at peak efficiency
✓ No dock wasted time
✓ Fixed per mile cost (vs. variable hourly)
✓ Less safety situations on open road
✓ Lane Selection - Trucking companies very selective in lanes they will run to reduce “deadhead” miles driven and keep equipment moving.
Network Design
“More is Less”

Oil price vs. inventory carrying and facility costs

Moving from $125/barrel to $150/barrel changes the optimal number of DC’s from 5 to 7. In particular, you can think of Las Vegas being replaced by Los Angeles, Albuquerque, and Portland.

Typ. Network Costs + Carbon Footprint Reduction
Even More DC’s result in less carbon!

Trade-Off Curve between number of DC’s, costs, service and carbon footprint

1.6% cost increase; 20% distance decrease 11% reduction in carbon

Logistics Leadership since 1904
Domestic Network Design
Retail / Consumer Demands
20 Year Impact of Big-Box Retailers
Less backroom stock space
Pushed inventory up-stream
- Merely learning what the U.S. auto industry learned from the Japanese in the 1980's.
- Reducing cash flow tie-up a factor
Demands frequent replenishment & smaller orders

However.... “amazon is Logistics”
- Amazon has impacted to the point where Target, Best Buy & Wal-Mart in 2011 announced plans to build smaller stores.
- The stores would carry prime movers and have internet order pick-up services.
- Speculation in industry that bigger, central DCs may make a come-back to serve this segment.

Domestic Network Design
amazon.com Impact
Fast & Furiously Building Many New DC's
All over the USA
Fulfillment Services Have Created Major Competition for all Retailers
Same Day Shipping
amazon.com Impact

The New Frontier
Amazon has put drop lockers in grocery stores for consumer pickup – geared to apartment dwellers who don’t trust neighborhood thieves.

Google Is Testing Same-Day Delivery for Shoppers

Google is now in the same-day delivery business. In San Francisco, some people can pick up a product, using their phone, at a convenience store, or hotel.

Impact

The Coming Frontier

New Grocery Shopping in Korea
Smartphone Shopping at Rail Stations
Food Delivered to Home

When every minute counts, turn to FedEx SameDay®.

For those times when you can’t afford to wait another day, FedEx SameDay is the fastest shipping option available to you. Reliable door-to-door delivery of your time-sensitive shipments within hours.

Fast, Fast, Fast.
Shipment within your city is easy.

Logistics Leadership since 1904
Urban Land Prices
Pushing Logistics Campuses Further Out

To Suburban Edge
- Adding increased transportation time, cost & congestion
- Land price increases on sites near freeway access & closer to urban center

“Big campuses can’t be too close to urban centers, but can’t be too far out either due to fuel costs”

The Sky’s the Limit
Existing Warehouse Stock Upgrades

Raising the Roof To Stay Closer To Urban Core
- As real estate prices go up and close-in locations disappear conversion of low height warehouses to tall structures will grow in practice
- Cheaper than new construction
- Photos: Albertson 600,000 sq. ft. DC Chicago – 18’ up to 38’

A. Epstein and Sons International, Inc. Chicago

Experts in field:
http://www.rooflifters.com/
The Sky’s the Limit
“Back-To-The-Future”

Multi-Story Warehouses In Your Future?
- Ocean port congestion and land availability & cost are the drivers
- Former U.S. multi-story warehouses now expensive condos!
- Found in Japan, China and Europe
- Up to 10 stories
- 20’ ceilings

Offshore Sourcing Implications
Changed U.S. Distribution Patterns & More DC / Warehouse Space Needed
1+ month of inventory added to system to cover travel times
- Distance adds time; More safety stock required
- 2008-2013+: Slower containership speeds for fuel efficiency adding additional time and inventory to system; 1-3 additional weeks

Landbridges Evolved
To haul import containers by rail from west coast to markets in mid & eastern parts of U.S.
**Landbridge Changing Economics**

All Water (vs. Rail) to East Coast

**Line Moving West**
- All water usually cheaper
- Trend started only 3 years ago.

**Panama Canal**

Today's New Ships Too Wide For Existing Lock Widths

**Expansion Completion in 2015**

25% of U.S. Imports flowed thru in 2008

Impact on landbridges in serious debate today

**Domestic Import Transportation**

Landbridge Changing Economics Again

**West Coast Ports Benefiting From Many Impacts in 2010-2013**
- Reflects improved intermodal rail service.
- Impact of “slow-steaming” by the container ships adds time to ocean portion that must be saved on landbridge portion.
- No one knows how long this reversed trend may continue, especially once the wider Panama Canal opens in 2015.

**Bottom Line:**

*No one really knows where this will end up!*
New Port Competition
Canada’s Prince Rupert

2 Days Closer to Asia

- Congestion + clean air mandates at LA Ports forcing many to look at alternative west coast ports and inland routes
- Being 2 days closer to Asia means that by the time a ship reaches LA Ports the container is already in the Midwest...!!
- Could MN benefit from this traffic flow?

U.S. Imports: System Jolt
Fuel Cost Impacts On Sourcing

Mexico vs. China
Can long supply chains still be cost effective?

Transportation Often Largest Cost in the Global Supply Chain
Global Sourcing Network

Re-evaluation More Important

When to move from off-shoring to in-shoring & near-sourcing

Source: MIT 10-2008

Case Study 1

Impact of fuel prices and rising Asian labor cost

Sourcing Parameters

- 37,000 SKUs
- Large range of Production Costs
  - $0.01 to $300 per unit if production is in the US
- Large Range of Weights
  - 0.01 to 5,000 pounds per unit
- Manufacturing options
  - US - Atlanta; Mexico - Monterrey; China - Shanghai
- Combination of transport modes
  - Ocean; Rail; Truck; Lead

Source: MIT 10-2008
Global Sourcing Network
Case Study 2
Impact of fuel prices + rising Asian labor cost
June 2012 Report

Factors influencing re-evaluation of offshore manufacturing:
- Fuel costs
- Complexity of supply chains and visibility issue
- Long lead times / excess inventory required
- Larger carbon footprints – “Green” movement impact
- Product Quality Controls
- Available labor pools in select countries: price & capacity
- Impact in China from growing internal consumer market (vs. export market)

Some European companies already set-up Manufacturing in USA
- Skilled labor force
- Automated manufacturing technology
- Strong transportation infrastructure
- Proximity to world’s largest market
- Political stability

NOTE: This even before the current Euro Financial Crisis
Wall Street Impact on Green
Investor Community sees “green” as reflection of good management

Everything already discussed today helps address Logistics industry undergoing changes to meet these new expectations

Warehousing in Logistics
5 Billion Sq. Ft of warehousing in U.S.

Floor area equals a 4 foot walkway from here to the Moon...!!!

The 5B only includes what’s under roof. Add another 40-50% to include outdoor dock & staging areas and we get a 6 foot wide walkway.

Industry has a massive impact on the Nation’s landscape
A Question I Ask Industry Audiences:
Have you ever given much thought to your facilities?
- Landscape?
- Stormwater?

...You Should...!!!
Facility Design
Stormwater Regulation Impacts

Changing facility design & management

- Traditional Focus: get stormwater off-site fast
- Today’s Focus: handle stormwater onsite and reuse

Few outside profession realize growing impact…!!!

EPA mandated cities to control their stormwater – quantity & quality

- Regulations required cities to comply with no additional Federal Funds, thus local fees.

Stormwater fees growing

- 2000+ cities to date nationwide.
- Minneapolis: $3,500+ per acre. Most warehouses use 20+ acres; cost is $70,000+/yr.

Minneapolis Logistics Campus
Stormwater Project

95% Impervious before project
22 acres
Minneapolis Logistics Campus
Stormwater Project

Basic Water Flow Design

Key:
- Main Retention Pond
- Bio Retention Basins
- Surface and underground pipe flow
- Underground only flow
- Overflow release to area storm system
- Prairie grass infiltration area

Minneapolis Logistics Campus
Stormwater Project

Net Result

100% stormwater fee credit
$68,000 annual savings (as of 2010)
50% federal depreciation deduction*

* NOTE: not known till after completion.

NOTE: Original design generated 78% stormwater fee credit.
“As-built” drawings = 102% net credit.

Site:
- 22 acres
- 95% impervious

Project Cost
- (Design + Const.) $580,000

Annual Storm water Fee
- $68,000

Payback in Years:
- 8.53 yrs

+ Federal Stimulus Package
  Immediate 50% Depreciation: $290,000

7.0 yrs after Fed Credit & Tax Impact
8.53 yrs simple pre-tax basis
Stormwater Fees
Growing in Use and Rising in Price

Property Owner Mitigation vs. City Revenue Needs
Is a Balance Possible?
- City’s need the cash to meet Federal Rules
- Private property mitigation good for environment and the city’s volume challenge
- Property owners will not do if no fee reduction!

Logistics Campuses are huge, growing & major sources of stormwater without management.

Site Design: Native Prairie vs. Lawn
19 Year Running Case Study
Murphy Logistics Campus
4700 & 4850 Main St NE, Fridley, MN 55421

Brown areas are native prairie
Photo taken in early spring.
Site Design: Native Prairie vs. Lawn

We Know There’s An Environmental Benefit

Native Prairie Benefits…
- Native plant materials selection.
- No watering required
- No fertilization required
- Roots are deep and assist stormwater infiltration

Are There Also Financial Benefits?

Site Design
Native Prairie vs. Lawn

Environmental & Economic Impacts

Manicured lawn costs 7.3x more to maintain than native prairie plants!
- Why have manicured lawn entirely surround large logistics, industrial / manufacturing facilities?

Native Prairie vs. Lawn

Total Cost Differences

<table>
<thead>
<tr>
<th>Total Costs</th>
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<tbody>
<tr>
<td>$25,000</td>
</tr>
<tr>
<td>$20,000</td>
</tr>
<tr>
<td>$15,000</td>
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<tr>
<td>$10,000</td>
</tr>
<tr>
<td>$5,000</td>
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<tr>
<td>$-</td>
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</table>

6 acres
Praire Areas

4.2 acres
Lawn Areas

$21,650
$4,240

$-
Site Design
Native Prairie vs. Lawn

Annual Maintenance Costs
Component Costs

<table>
<thead>
<tr>
<th></th>
<th>Existing Set-up</th>
<th>Cut Lawn</th>
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<tbody>
<tr>
<td></td>
<td>Prairie Areas</td>
<td>Lawn Areas</td>
</tr>
<tr>
<td></td>
<td>6 acres</td>
<td>4.19 acres</td>
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<tr>
<td>Maintenance</td>
<td>$4,240</td>
<td>$ -</td>
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<tr>
<td>Mowing</td>
<td>$-</td>
<td>$12,015</td>
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<tr>
<td>Watering</td>
<td>$-</td>
<td>$8,630</td>
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<tr>
<td>Fertilization</td>
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<td>$1,005</td>
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<tr>
<td>Total Cost:</td>
<td>$4,240</td>
<td>$21,650</td>
</tr>
<tr>
<td>Cost / Acre.:</td>
<td>$707</td>
<td>$5,167</td>
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If all

“Over the last 18 years we have saved over $947,428 while being green by planting native prairies on 2 logistics campuses…!!!”

Prairie Maintenance
Key to success…!!!

No Such Thing as a Maintenance Free Landscape
Provided since day one by

Prairie Restorations, Inc.

Prairie Restorations of Princeton, MN
www.prairieresto.com

- Services include site visits 4-6 times per growing season and burning every 2-3 years.

Brown areas are Native Prairies
Native Prairie vs. Lawn
ROI of Prairie vs. Lawn Installation

<table>
<thead>
<tr>
<th></th>
<th>Install Cost</th>
<th>Install Cost</th>
<th>Savings per Year of Prairie vs. Lawn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 Acres</td>
<td>vs. Prairie</td>
<td></td>
</tr>
<tr>
<td>Prairie</td>
<td>$34,320</td>
<td>-</td>
<td>$26,762</td>
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<tr>
<td>Seeded Lawn*</td>
<td>$48,000</td>
<td>1.4x</td>
<td></td>
</tr>
<tr>
<td>Sod*</td>
<td>$111,000</td>
<td>3.3x</td>
<td></td>
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</table>

* Does not include $30,000+ cost of sprinkler system.

Maint. Cost

<table>
<thead>
<tr>
<th></th>
<th>6 Acres</th>
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</thead>
<tbody>
<tr>
<td>Lawn:</td>
<td>$31,002</td>
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<tr>
<td>Prairie:</td>
<td>$4,240</td>
</tr>
<tr>
<td>Cost Difference:</td>
<td>$26,762</td>
</tr>
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1.28 Years

Native Prairie vs. Lawn
Do they look OK?

Neighbors love it!!!
We run 33,000 trucks / yr. through the neighborhood yet the #1 thing I hear is.....

"...oh, you're the guys with all the pretty flowers on Main St."

Start-up Issue....
- Prairie plants often do not meet city lawn height ordinances!
- Needed a variance in 1994 with 1st one.
- Former Landscape Architecture student of mine was Fridley's Asst Planner & understood what our goal & allowed us to proceed - the rest is history!

Photos show native prairies at Murphy's Campuses - 14 acres total at four facilities.
Native Prairie vs. Lawn
Results of Native Plantings – “Wildlife”

Fox, Deer, Eagles, Hawks, Numerous Bird Species, Ducks, Fish

- Eagles dive into water and pull out fish!
- Pictured right is a 12 point buck at the 7033 Fridley Facility, Fall 2009.

Former EPA Superfund site cleaned and developed by Murphy in 1999.
7033 Central Ave NE, Fridley, MN 55432
7 acre native prairie surrounding retention and ground water pond. Site where Eagles dive for fish.

Native Prairies & Trees
Environmental Metrics

Carbon Sequestration Annual Benefits
14 Acres of Native Prairie

- 24.93 MtCO$_2$e/Year

732 Trees

- 275 Oaks, 274 Maples, 183 Spruce/Pines
- 117.1 MtCO$_2$e/Year

Carbon Sequestered by Murphy’s Trees and Prairies over 14 years:
- 5,009,961 pounds

Facility Design
Gray + Green Infrastructure
Cities starting to treat & regulate street trees like sewers and roads.
- To handle urban heat, stormwater, and improve real estate values thus higher property tax values.

Only a matter of time before they look to private property to help in this effort.

Gray Infrastructure

Green Infrastructure

Green Urban Infrastructure
Why Trees Will Be In Your Future

Trees and Stormwater Management
- Mature trees hold nearly an acre-foot of stormwater...!!
- In other words: the leaves & branches hold 80% of 1" rain in 24 hrs. In Minneapolis this represents 90% of all storms!
- Reducing stormwater prolongs life of sewers and pipes. Cities today can’t afford to replace old and wearing out systems!
Green Urban Infrastructure
Why Trees Will Be In Your Future

“Urban Bonsai”
That’s what we grow for city trees today

To Receive Benefits More Soil
Needed For Root Growth
It’s a very simple concept

Typ. 15+ year old city trees

Natural 10 year old tree

Green Urban Infrastructure
Impacts From Trees

Urban Infrastructure
New planting technologies allow more soil:

- Tree root growth - thus bigger trees
- Stormwater - holding & recycling
- Gray Infrastructure - reducing stormwater
  prolongs life of sewers and pipes. Cities today
  can’t afford to replace current old and wearing
  out systems
- Shade - more due to bigger tree growth reducing
  urban heat island impact
- Increased property values

Silva Cell example in Minneapolis (http://www.deeproot.com)

Technique readily useable on Logistics / DC Campuses
Green Urban Infrastructure
Impacts From Trees

University Ave LRT Corridor
Trees & Stormwater Control

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Current Landscape & Trends That Will Impact Your Practice

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