

# *Heating The Midwest With Renewable Biomass*

Urban Wood Procurement and Processing Strategies

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Jeff Guillemette, Biomass Fuel Manager

[jeff.guillemette@ever-greenenergy.com](mailto:jeff.guillemette@ever-greenenergy.com)

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# *Saint Paul's Community Energy System*

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Environmental Wood Supply

[www.ever-greenenergy.com](http://www.ever-greenenergy.com)

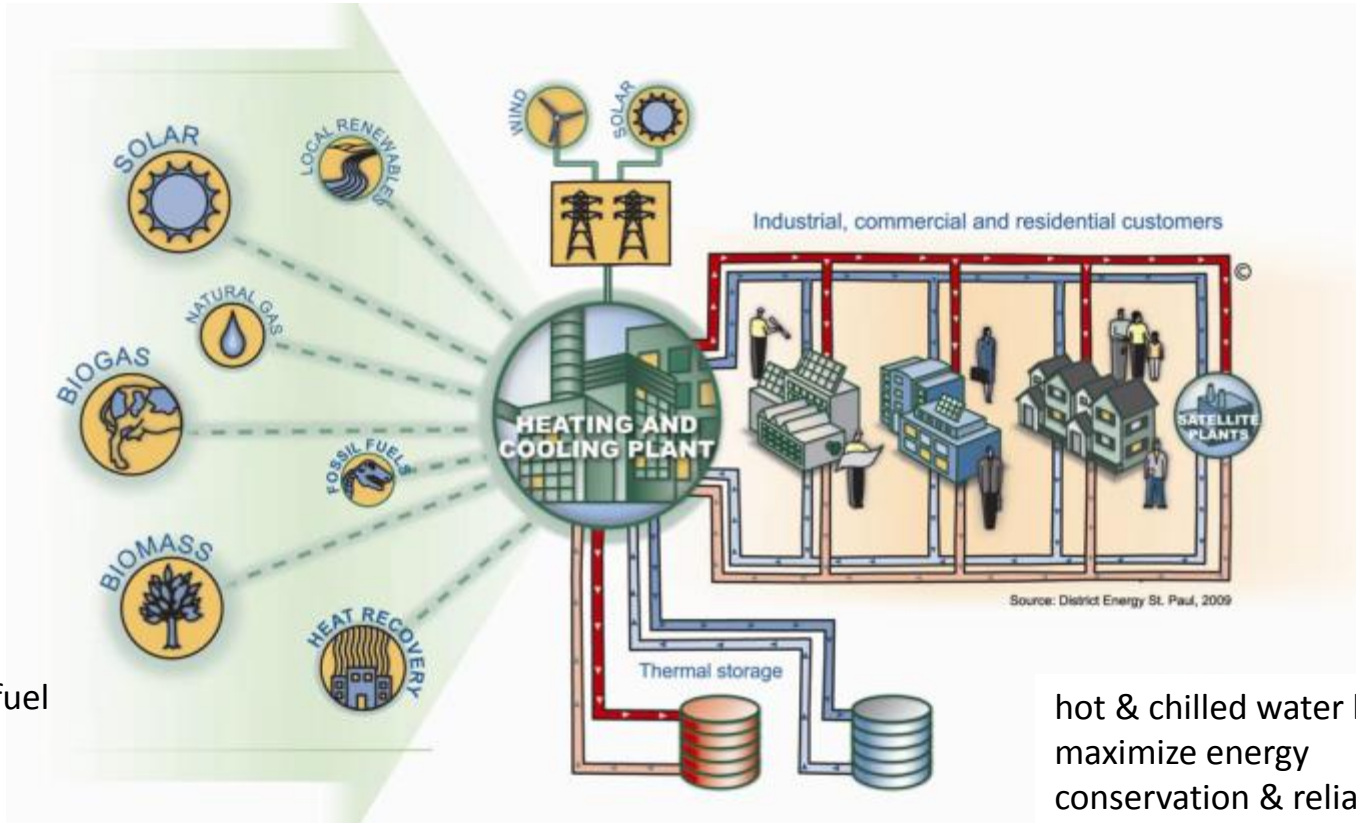


# Community Scale Heating and Cooling

- Underground network of pipes aggregate heating and cooling needs
- Aggregated thermal loads allows application of technologies and fuels not feasible for individual buildings
- Increases fuel flexibility, rate stability, and reliability



# Integrated Energy System



flexible &  
renewable fuel  
sources

hot & chilled water loops  
maximize energy  
conservation & reliability

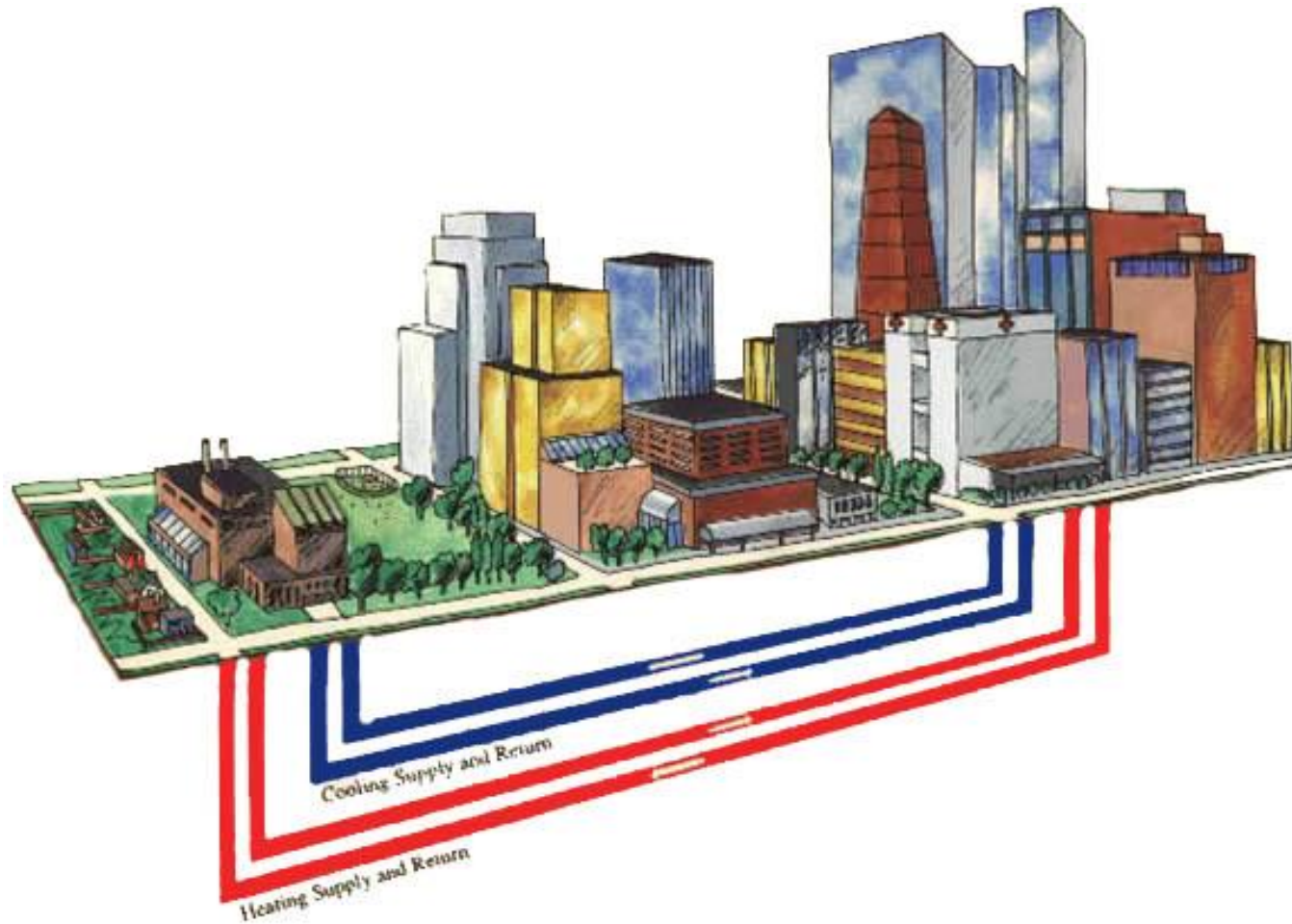
reliable and effective  
production & storage



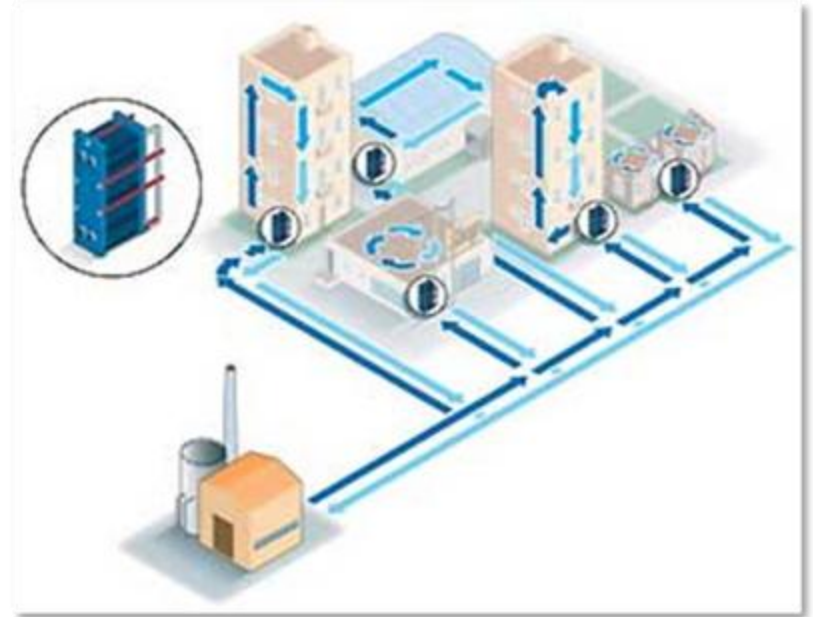
# District Heating



# District Energy – How it Works



# District Cooling



# Thermal Storage

- 6.5 million gallons of storage capacity
- Chilled water storage reduces peak-electric demand
- Firm capacity for weather events





# Solar Thermal Integration



# Heating and Cooling Saint Paul



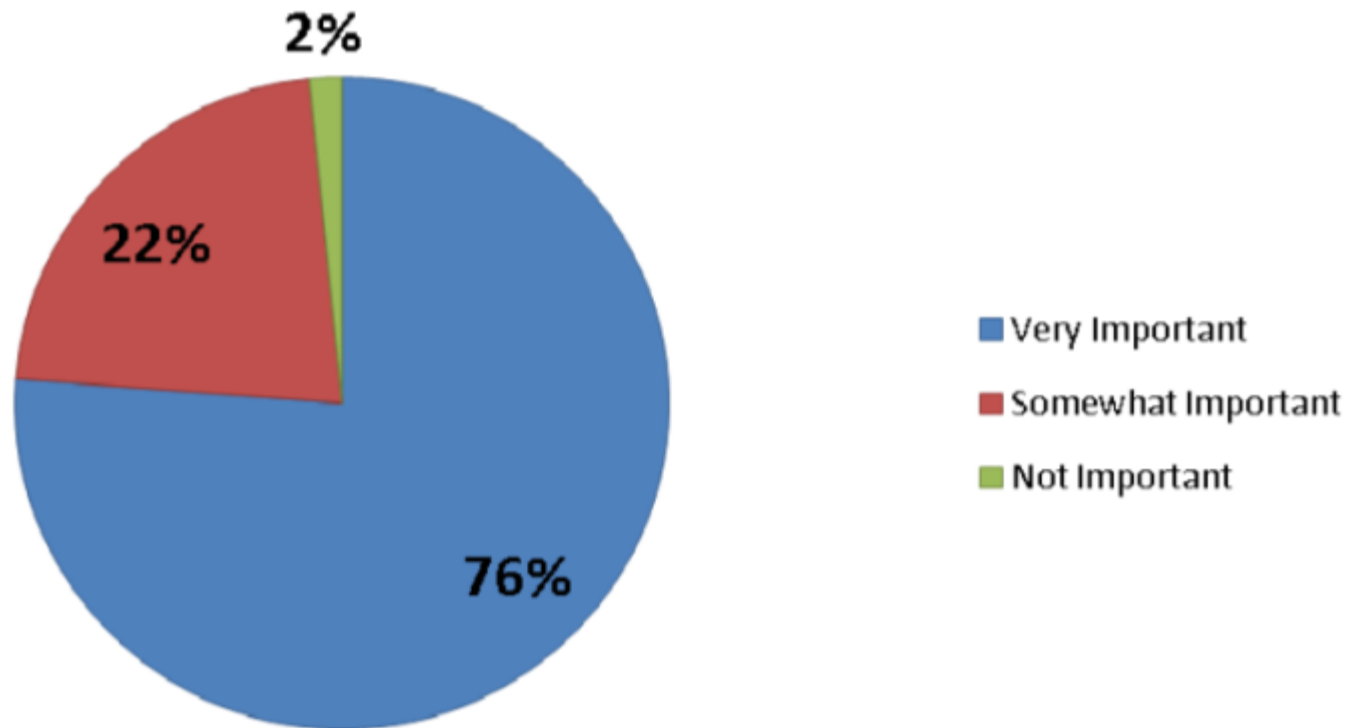
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# Importance of Renewables to Customers

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# Combined Heat & Power

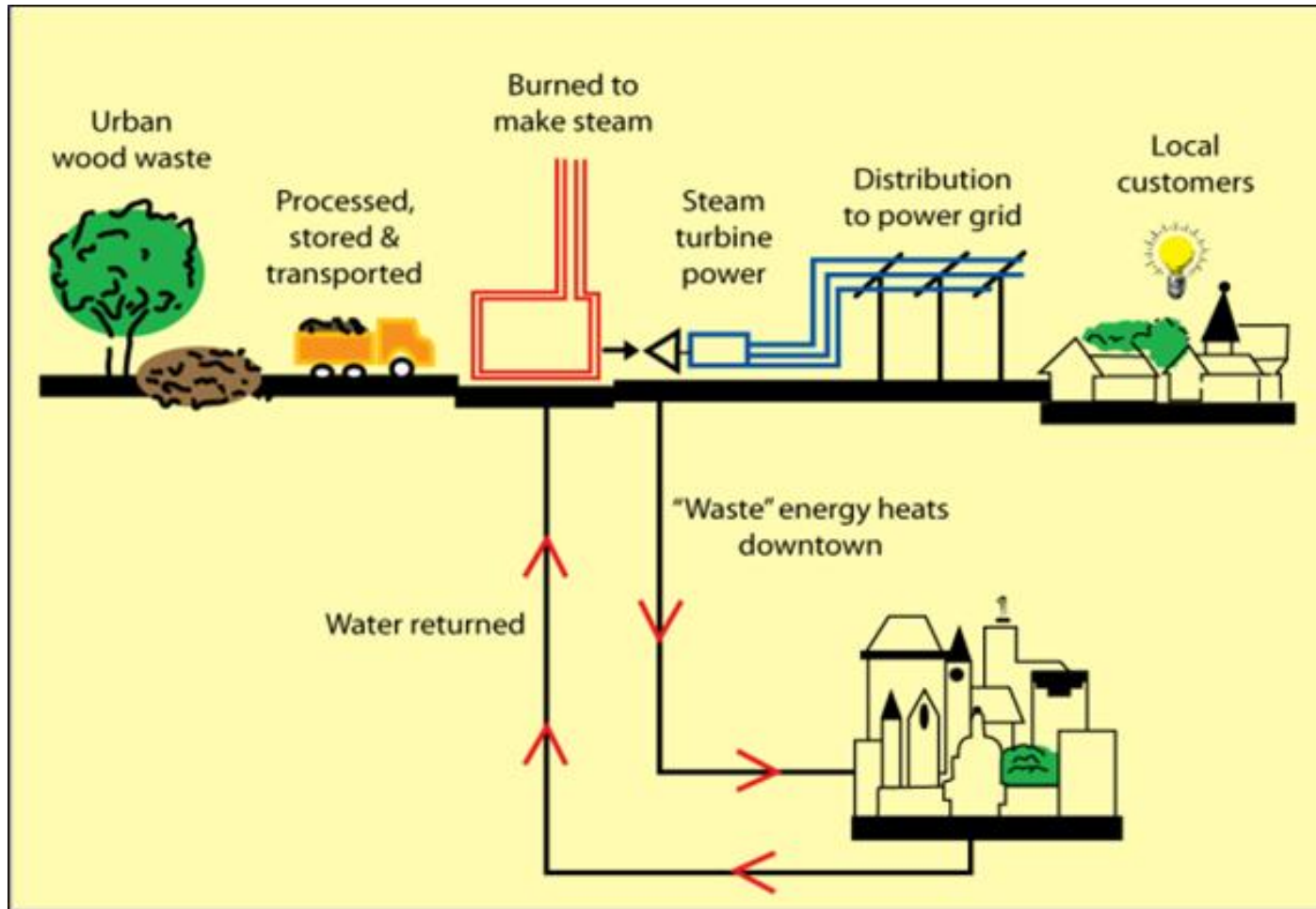
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- 25 MW of electricity
- Renewable, clean, urban wood residue
- Greenhouse gas CO<sub>2</sub> reduced up to 280,000 tons per year



# Integration of Biomass-Fueled CHP



# St. Paul Cogeneration – Combined Heat & Power

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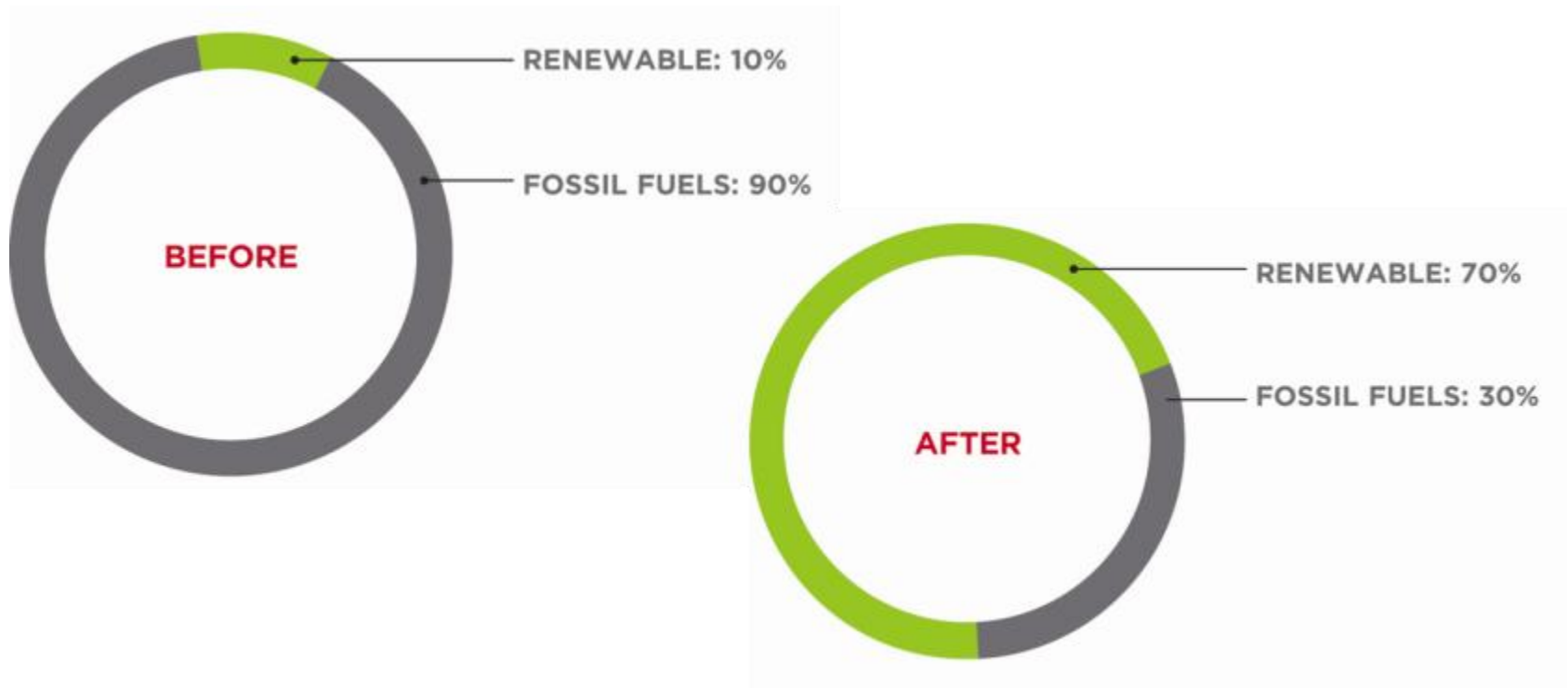


- 25 MW of electricity
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# Fuel Diversification

## Before and After Wood-Fired CHP Project



# Biomass Advantages

- Large quantities in metro area
- Wood waste diverted from landfills
- Economically viable
- Community based





# Storm Damage



# Wood Waste Processing



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# Biomass – Where it comes from?

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- Wood residuals from a manufacturing process such as pallets
- Construction waste/clean dimensional lumber
- Urban and park tree trimmings
- Storm damaged trees
- Trees removed for urban development
- Trees removed as part of a timber management plan/restoration
- Trees grown for the purpose



# Wood Waste Loader



# Wood Waste Processing



# Linking Habitat Restoration to Bioenergy

- In 2007, the Minnesota legislature appropriated \$4,500,000 to study renewable energy options for RockTenn (major recycler in St. Paul)
- \$500,000 for ecological restoration by removing ecologically inappropriate woody plant material
- DNR created small grants pilot project to cut, move and stage woody biomass material from public and private lands
- Project partner is District Energy St. Paul



# Linking Habitat Restoration to Bioenergy

## Goals:

- Facilitate habitat restoration efforts
- Provide a local source of energy
- Explore feasibility including cost/benefit
- Replicate

## Benefits:

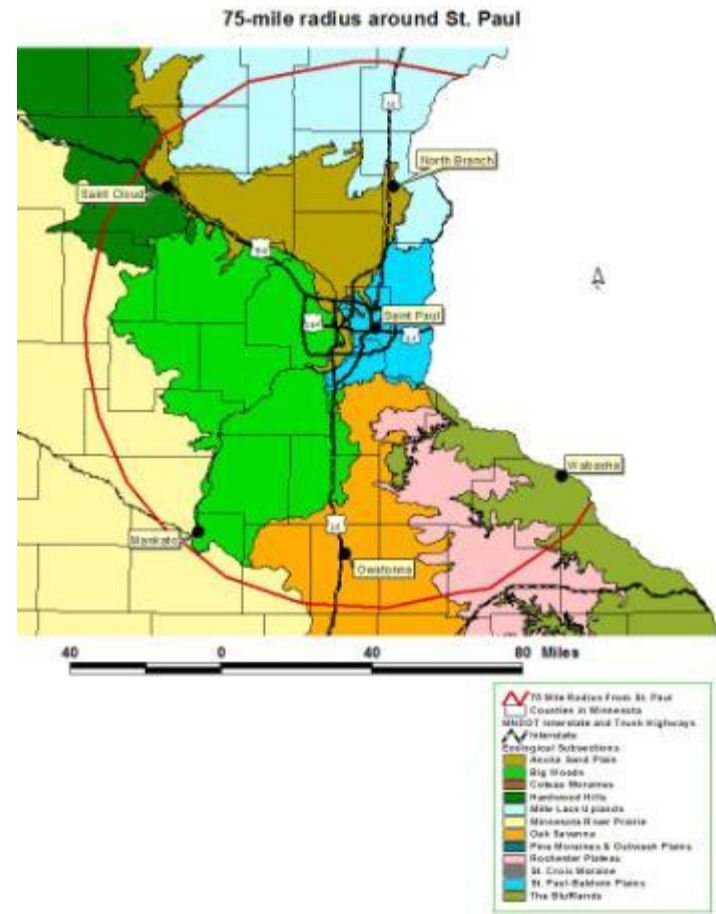
- Increase healthy native habitats
- Utilize traditionally discarded woody biomass as bioenergy
- Supplement landowner resources for habitat restoration



# Linking Habitat Restoration to Bioenergy

## The need:

- More than 7,000 acres of restorable habitat
- in need of tree and shrub removal
- have been identified on public and private land
- within 75 miles of St. Paul!





# Linking Habitat Restoration to Bioenergy

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## **Pilot Approach ➡ Develop Procedures and Criteria:**

- Ecological value of the site – MCBS ranking
- Restricted to 75 mile radius of St. Paul
- Estimated volume at least 20 semi-truckloads
- Suitable roads/trails and staging area
- Current Management Plan (less than 10 years old)
- Capacity to manage project and write Harvest Plan
- Capacity and commitment for post-harvest management to achieve and maintain long-term restoration goals



# Linking Habitat Restoration to Bioenergy

## 15 Pilot Projects Completed a/o January 2011:

- Pilot Knob Hill, 3 acres, City of Mendota Heights
- Hastings Sand Coulee SNA, 7 acres, MN DNR
- Schuneman Marsh Preserve, 3 acres, Izaak Walton League
- Indian Mounds Park, 12 acres, City of St. Paul
- Bridgeview Park Reserve, 15 acres, Sherburne County
- Lake Edith (2 phases), 90 acres, Belwin Conservancy
- Zumbro Falls Woods SNA, 29 acres, MN DNR
- Kelleher Park, 23 acres, City of Burnsville
- Fort Snelling WPA Camp, 17 acres, MN DNR
- Uncas Dunes SNA-South Unit (2 phases), 47 acres, MN DNR
- Alimagnet Park, 28 acres, City of Burnsville
- DNR St. Paul Hatchery A.M.A., 8 acres, MN DNR
- Stagecoach Prairie Natural Area, 12 acres, Belwin Conservancy



# Linking Habitat Restoration to Bioenergy

Pilot Knob Hill - 3 acres of mixed hardwoods restored to oak savanna/prairie, 16 loads, 320 tons, \$21.50/ton



*Photos courtesy of MN DNR*



# Linking Habitat Restoration to Bioenergy

Schuneman Wildlife Preserve - 3 acres of pine plantation  
and invading hardwoods to oak savanna, 16 loads,  
320 tons, \$12.33/ton



*Photos courtesy of MN DNR*



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# Linking Habitat Restoration to Bioenergy

Lake Edith Prairie and Savanna Phase 1, Belwin Conservancy -  
74 acres of mixed hardwoods, conifers and shrubs to prairie  
and oak savanna, 209 loads, 4,180 tons, \$19.47/ton



*Photos courtesy of MN DNR*



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# Linking Habitat Restoration to Bioenergy

Fort Snelling WPA Camp, MN DNR - 17 acres of buckthorn with  
some mixed hardwoods to prairie and oak savanna,  
19 loads, 380 tons, \$28.37/ton



*Photos courtesy of MN DNR*



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# Linking Habitat Restoration to Bioenergy

## Results:

- Nearly 300 acres treated on 15 project sites
  - Range = 3 acres to 50 acres
- Avg. cost/ac treatment = \$1,447
  - Range = \$346/ac to \$2,308/ac
- 521 loads totaling 11,023 tons of biomass to DE
- Avg. cost per ton = \$49.46
  - Range = \$9.63/ton to \$142.69/ton
- 6 DNR, 4 City, 4 NGO, 1 County



# 2010: Linking Habitat Restoration to Bioenergy and Local Economies

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- In 2010, an additional \$600,000 provided by the MN ENRTF
- Builds on the success of the pilot project
- Expands market opportunities for the biomass
- Will assess the feasibility of market-driven ecological restoration
- Funding available until June 2013







Example of Cost Tracking Data

# Data by Location

	Average of miles to EWS	Average of Mobilization cost	Average of Trucking cost	Total Tons of wood	Average of Cost/ton
Anoka	23.25	\$412.00	\$4,811.31	4202	\$15.77
Dakota	23	\$486.00	\$7,908.00	2046	\$12.96
Goodhue	32.5	\$720.00	\$15,730.00	2244	\$21.27
Hennepin	17.25	\$430.00	\$7,116.88	3586	\$14.20
Ramsey	11.38	\$297.92	\$3,411.19	13882	\$6.49
Scott	43	\$494.00	\$5,504.00	528	\$16.13
Chisago	47.8	\$308.00	\$6,398.40	3256	\$15.52
<b>Total/Avg.</b>	<b>19.6</b>	<b>\$358.50</b>	<b>\$5,008.77</b>	<b>29744</b>	<b>\$10.70</b>



# Grinder Type Data

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Row Labels	Average of Cost/ton	Average of Mobilization cost	Average of Net Fuel cost	Sum of Tons of wood	Count of Job#
Horizontal grinder	\$11.30	\$484.33	\$1,375.02	10,648	18
Tub grinder	\$10.35	\$283.00	\$1,338.51	19,096	30
Total/Avg.	\$10.70	\$358.50	\$1,352.20	29,744	48

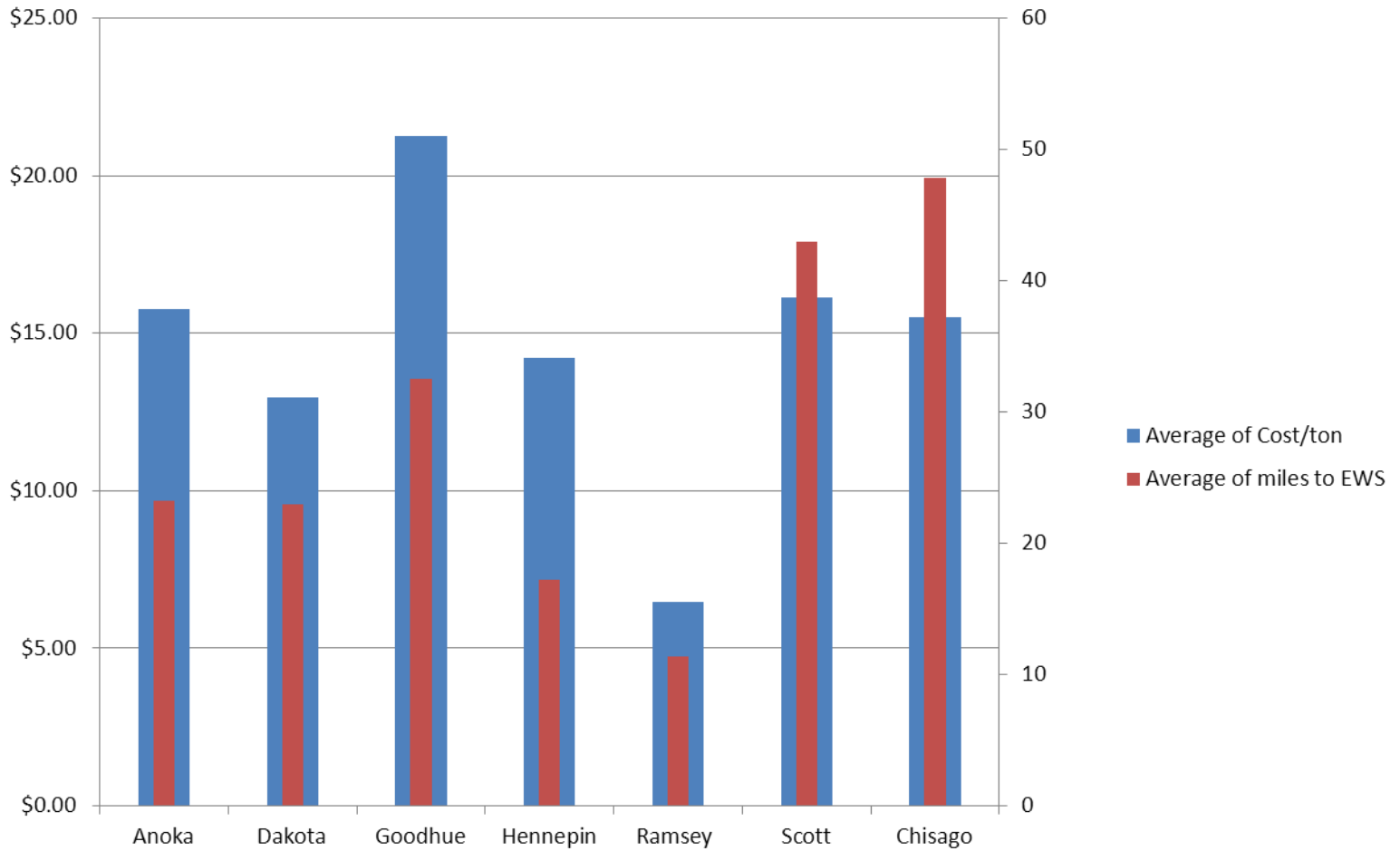


# Wood Source Data

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	Average of Cost/ton	Sum of Tons of wood	Count of Job#
Trees removed as part of timber management	16.27	1,408	1
Urban/park tree trimmings residuals	10.23	26,136	44
wood from trees down from storm	16.35	1,298	2
Wood from storm damage	14.82	902	1
<b>Total/Avg.</b>	<b>10.70</b>	<b>29,744</b>	<b>48</b>





# QUESTIONS?



Jeff Guillemette, Biomass Fuel Manager  
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