IPRO 347: Robbins Community Power
Wood Utilization Study
• Original configuration of Robbins Community Power

  Municipal Solid Waste → Energy

• Future Configuration of Robbins Community Power

  Chipped Wood → Energy
  -75% Construction Waste
  -25% Green Wood
A large percentage of urban wood is underutilized: chipped into mulch or compost, or disposed of in a landfill.

The goal of this IPRO is to determine and designate a higher value to this urban wood.

This “green” wood is necessary fuel for Robbins Community Power Plant.

Other uses include processing this wood into lumber or producing wood pellets for boilers.
Goals

- Provide an alternative for municipalities and landscaping companies to dispose of the urban wood by providing incentives for their participation in the recycling of the wood.
- Determine the highest value of wood and process it accordingly.
- Supply Robbins Community Power with enough green wood to fuel their boiler.
Tasks: Based on the work needed to accomplish our goals, we divided work amongst our team as follows.

- Chicago's Urban Forest
- Sawmill Processes
- Sawmill Program
- Site Logistics
- Budgeting
- Licensure
- Equipment
- Wood Boilers / Pellets

Structure: Because of the variety of duties, each member is responsible for a specific aspect of the project. Goals are set for each member based on class discussions and each member reports on his/her findings on a class-to-class basis.
Chicago’s Urban Forest Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trees</td>
<td>3,585,000</td>
</tr>
<tr>
<td>Tree cover</td>
<td>17.2%</td>
</tr>
<tr>
<td>Most common species</td>
<td>white ash, mulberry, green ash,</td>
</tr>
<tr>
<td></td>
<td>tree-of-heaven</td>
</tr>
<tr>
<td>Percentage of trees &lt; 6-inches diameter</td>
<td>61.2%</td>
</tr>
<tr>
<td>Pollution removal</td>
<td>888 tons/year ($6.4 million/year)</td>
</tr>
<tr>
<td>Carbon storage</td>
<td>716,000 tons ($14.8 million)</td>
</tr>
<tr>
<td>Carbon sequestration</td>
<td>25,200 tons/year ($521,000/year)</td>
</tr>
<tr>
<td>Building energy reduction</td>
<td>$360,000/year</td>
</tr>
<tr>
<td>Increased carbon emissions</td>
<td>-$25,000/year</td>
</tr>
<tr>
<td>Structural value</td>
<td>$2.3 billion</td>
</tr>
</tbody>
</table>

Ton – short ton (U.S.) (2,000 lbs)
Log Grading

Figure 1. Example evaluation of rot and shake.

Rot is a defect in all 4 quadrants.

Rot not a defect in quadrant 1 or 2.
Shake not a defect in quadrant 3.
Shake is a defect in quadrant 4.
Sawmill Processes

Unload logs → Grade/Sort → Milling Process → Circle Mill/Band Mill
- Sort by species and length.
- (2) piles each to prevent rotting.

“Basement”
- Vibrator in trough that transports waste pieces of lumber.

Chipper

Chip Trailer
- Collects wood chips in a container that can be loaded onto a truck.

Sawdust Trailer
- Collects sawdust in a container that can be loaded onto a truck.

Edger
- Horizontal or vertical.
- Cut into desired lumber dimensions.

Green Chain
- Conveys and slows down transport flow of logs so manual stacking is possible.

Stacking

Storage

Transport
• **Main Drive** - beneficial to have separate in and out paths

• **Log Inventory** - organize according to species and length
  - rick sizes vary according to how the logs are being stacked and organized

• **Trailers** - sawdust, chips
  - 48 ft trailer needs 61-62 ft radius circulation

• **Unloading Area** - sorting

• **Parking Lot**

• **Office with Restroom**

• **Sawmill** - Machinery, manufacturing
Prefabricated 200’x250’x16’ steel building to house equipment and office

Site will be at least 10 acres and also include:
- Unloading, loading, sorting, and inventory areas
- Main drive and parking
- Outdoor drying and storage areas
- Dust/chip trailers
Equipment Selection and Pricing

- **Impact of Equipment:**
  - **Price:** relates directly to budget
  - **Operating Space:** size of machinery drives storage requirements
  - **Logistics:** mechanical performance of machines impacts organization of process

- **Methodology:**
  - **Determine need:** involves developing “big picture” of operations and determining all equipment necessary to fulfill goals
  - **Sample cost:** research various avenues for acquiring equipment, taking a wide sampling of used prices
  - **Optimize:** using manufacturer spec sheets, determine which products meet needs and which do not
  - **Decide:** either select the exact product (specific) or settle on price range (general)
• Tub Grinder
• Kiln
• Sawmill (Bandmill)
• Edger
• “Basement”
• “Green Chain”

• Rough Terrain Forklift
• Front End Loader
• Truck Scale
• Grapple Truck
• Semi-Trailer
• Bobcat
- Conducting mostly internet research, price sheets are compiled for various makes/models of each machine. All prices found are for used items to minimize cost.
- An example Tub Grinder price sheet compiled from closing auction prices is shown below. (all auction results taken from Ritchie Bros at www.rbauction.com)

### Tub Grinder

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
<th>S/N</th>
<th>Meter [h]</th>
<th>Price</th>
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<tbody>
<tr>
<td>DIAMOND Z</td>
<td>PWG1463</td>
<td>38S14626</td>
<td>-</td>
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<tr>
<td>DIAMOND Z</td>
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<td>DURATECH</td>
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<td>502CJXXXX</td>
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<tr>
<td>HOGZILLA</td>
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<td>XXXX</td>
<td>7158</td>
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<tr>
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<tr>
<td>HOGZILLA</td>
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<tr>
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<td>1447</td>
<td>345000</td>
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<tr>
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<td>345000</td>
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<td>VERMEER</td>
<td>TG9000</td>
<td>1VRY434864100XXX X</td>
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<td>112635</td>
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</table>

- Decide: Knowing which equipment will meet our needs and knowing the market price for used versions of these products, it is a simple matter of revisiting the price sheet and making an educated price quote.
Licenses and Permits

- Tax Registration
- Employer Identification Number (EIN)
- Illinois Tax Registration
- Business Licenses
- Local Permits
- Business licenses/Tax permits
- Building Permit
- Health Permit
- Occupational Permit
- Alarm Permit
- Zoning Permit
- Transportation Permit
- Equipment/Training Permit
- Air Pollution Permit
  - Environmental Regulations for the State of Illinois
  - Title 35 of the Illinois Administrative Code
- Waste Management’s Permit
- Water Pollution Control Permit
- Public Water Supply Permit
- Livestock Import/export Permit
- Land Pollution Control Permit
Challenges

• Communication:
  • We are relying on many sources outside of RCP to obtain necessary information. Efficient communication can be difficult, especially when they are not directly included in the project.
  • Oftentimes the nature of our questions requires complex answers, making it necessary to arrange meetings which requires more time.

• Resources:
  • This project requires a significant amount of research and human resources are relatively small.
  • This project has a long term focus whereas the IPRO timeframe is relatively short.
We are making good progress toward our goals. We have achieved a clear understanding of what needs to be done and everybody is consistently fulfilling their roles. Especially considering the time/human limitations, our progress is strong.