

Adapting 20-Years of Biomass Feedstock Supply Chain Innovations to MSW (and Recyclables)

**A Dramatically Shorter Development Cycle Resulting from
Cumulative Know-how, Science, and Engineering**

Jim Dooley

forestconcepts™

Our Place in the Bioeconomy

There are hundreds of firms bringing bio-based materials, products, fuels, chemicals, etc to market.

- Some have already succeeded
- Many are on a track to commercial scale
- Some have failed, others will fail
- BUT, the trend is solid and accelerating

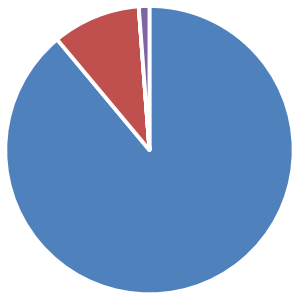
The one constant is they all need raw materials and sustainably produced, high quality, cost-effective renewable feedstocks.

Woody Biomass Resources 1970 - 2020

Supply-side Volume Competition Intensifies

1970
~100 mm tons

%



- Mill Residuals
- Forest Health
- Plantations
- Dead Trees

Mill Residuals

Forest Health

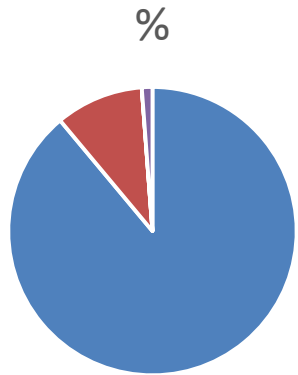
Forest Residuals

Woody Biomass Resources 1970 - 2020

Supply-side Volume Competition Intensifies

1970
~100 mm tons

1995
~200 mm tons



■ Mill Residuals ■ Forest Health

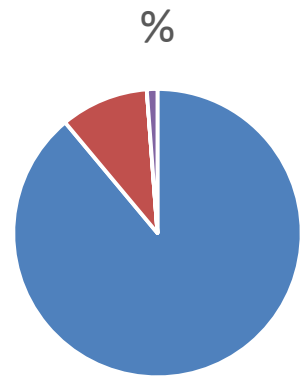
■ Plantations ■ Dead Trees ■ Mill ■ Health ■ Plantations ■ Dead Trees ■ Forest Residuals ■ wildfire



Woody Biomass Resources 1970 - 2020

Supply-side Volume Competition Intensifies

1970
~100 mm tons



1995
~200 mm tons



2020
~400 mm tons

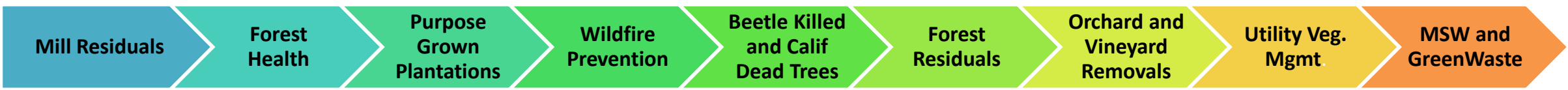


■ Mill Residuals ■ Forest Health

■ Plantations ■ Dead Trees

■ Mill ■ Health ■ Plantations ■ Dead Trees ■ Forest Residuals ■ wildfire

■ Mill ■ Health ■ plantations ■ dead trees ■ forest residuals ■ orchards ■ Utility

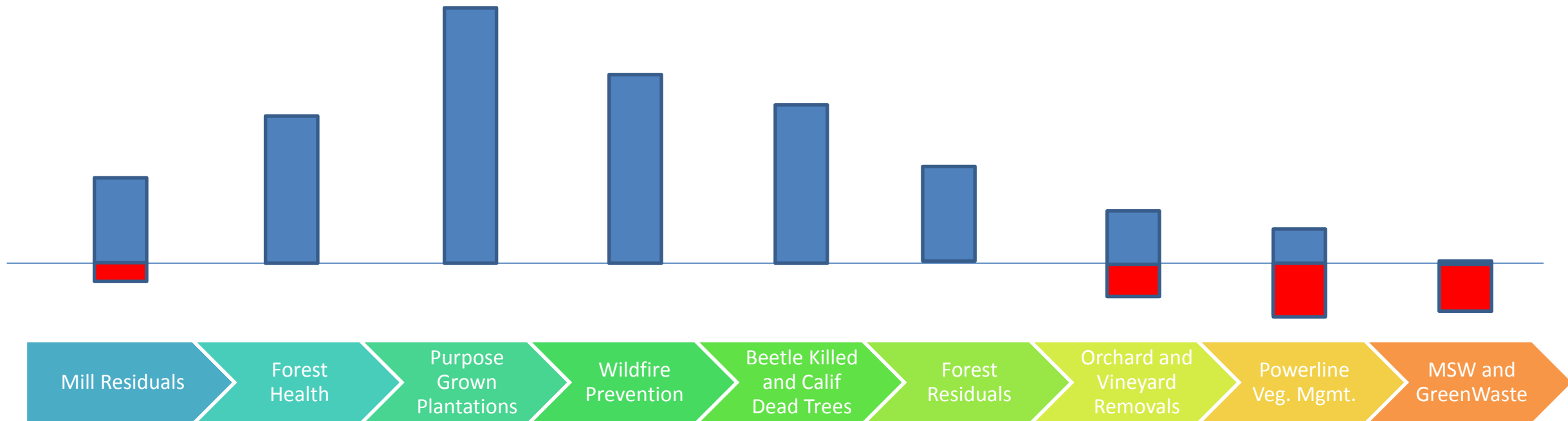


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Woody Biomass Resources 2020

Supply-side Price Competition Intensifies

Relative Delivered Cost to Bioeconomy User - 50 miles



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DOE Supply Chain Technologies

- Logistics Modeling
- Characterization
- Milling, screening, drying, washing, leaching...
- Uniform Format Feedstocks
 - Homogenization
 - Densification
 - Synergistic Benefits of Blended Feedstocks

Uniform Format Feedstocks

- Homogenized content
- Uniform size
- Highly flowable
- Efficient bulk handling



Miscible Feedstocks – Designer Blends

- OCC (Amazon boxes)
- Wood chips (forest health)
- Poly mailers (Amazon bags)
- Soft drink bottles (Mt. Dew)
- Water bottles (Costco 500 ml)

The pile in the center includes all these components in a stable blend



What About Real MSW?



Raw from Shredder

6 mm Crumbled

2 mm Crumbled

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Thank you!



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