

Value-added Products and Markets: What Can be Done With all That Woody Biomass?



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Update to presentation at Smallwood 2002



We already are raking the Forest!

Cleaning the forest floor, removing ladder fuels, and burning the piles

Tonto National Forest Oct 29, 2018 forest update reports more than 1,100 acres of the forest was cleaned and piled for burning of the piles this fall and winter.

300-acre pile burning near Colcord Estates

296-acre pile burning near Erosion Tank

224-acre pile burning completed near Tonto Village

74-acre pile burning complete near Tonto Creek Estates

206 acres of piles have been completed near Pyeatt Draw

Unfortunately, that work creates a lot of smoke for weeks as the piles are burned.

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The alternative to burning is to bale the piles and transport them to central places for conversion to products, provide fuel for biomass power plants, or to burn with controlled low-emission equipment.

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Forest Concepts, LLC

A technology company enabling the bioeconomy

Forest Concepts' Appreciative Design methods meld plant structural biology, disciplined design, and engineering science in a stakeholder-driven process that leads to uncommonly innovative and effective solutions to new and longstanding needs of our clients and customers.

Our applications span the feedstock and biomaterials supply chain from field and forest to the throat of final conversion process equipment.

Our core technology expertise includes densification, milling, drying, materials handling, quality assurance, and materials properties measurement.

Forest Concepts' 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 and biomaterials.

Forest Concepts' Business Segments



Baler Equipment
Roundwood Transport



Industrial Processing Equip.
Crumbler® Systems



Biomass Drying
Advanced Dryer Systems



Biomaterials and Feedstocks
Erosion Control Materials

WoodStraw®

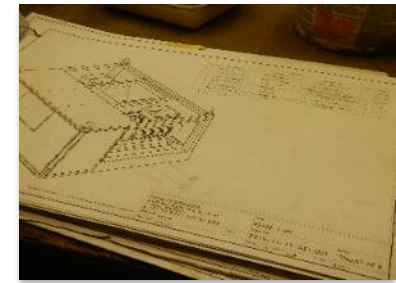
Crumbles®

UltraChar®

Shredz®

Siskin Ridge Roundwood™

ELWd™ habitat



FC Research & Development

Policy Constraints on Forest Biomass Utilization

- Must not use merchantable logs and chips
 - Definition of merchantability is very local and fluid
- Must not use biomass needed to be retained on-site for soil health, habitat, and ecosystem services

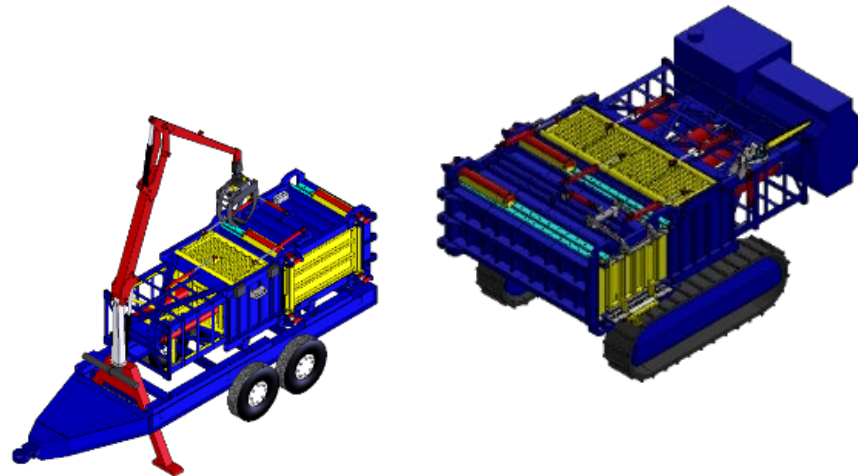
That leaves the rest of the wood and biomass for us to use for economic and societal good!

Enclave Approach

- Woodyard
 - Biomass Depot
 - “Junkyard for wood”
 - Community Biomass Center
 - Centralized Biomass Feedstock Operations Site
-
- If you touch it, add value!
 - Minimize the value-normalized transportation distance
 - The least cost is to deliver products to your neighbor with a forklift
 - You can afford to haul gold further than the mine tailings

Bales and Roundwood instead of Chipping

- **Preserve opportunity for value-added end uses**
 - in-field chipping/grinding greatly reduces number of markets & products
- **Minimize labor, noise, dust, ... at work sites**
- **Reduce transportation cost by using conventional flatbed trucks, trailers, rail, ...**



Market Opportunities

- **Posts and Poles** - rustic furniture, landscape features, architectural accents, fencing, agricultural products, ...
- **Biopower** - hog fuel, wood pellets, solid densified fuels, bio-coal, ...
- **Milled and screened products** - mulch, erosion control, horticulture, soils, ...
- **Industrial fiber feedstocks** – absorbents, bulking agents, biofuels, biochemicals, ..
- **Liquid and gaseous biofuels** – diesel, fuel oil, natural gas, aviation fuel, ...
- **Biochar** – adsorbents, water filtration, soil amendment, horticultural soils, ...

See also: TSS Consultants - North Fork Calif Feasibility study Pg. 40-45 <https://ucanr.edu/sites/swet/files/176222.pdf>

Opportunity: Small diameter logs to industrial veneer

- Roundwood blocks
 - as short as 16 inches
 - 5 – 13 inches diameter
 - As long as 54 inches
- Veneer thickness
 - 1/10 inch (2.5mm)
 - Up to 1/5 inch (5mm)
- Green logs work best
- Core:
 - 1-3/4 to 2 inches diameter
 - Sell as stakes



It's the solid equivalent of market pulp!

Opportunity: Precision Feedstocks & Materials

- Precision feedstocks for conversion to biofuels, biochemicals, and bioproducts
- Biomass in, biomass out - making small particles
- Veneer, wood chips, and herbaceous biomass



Crumbles® Industrial Raw Material

Higher yields and lower downstream processing costs from better feedstocks



Raw Wood Chips



Conventional Hammermill



Forest Concepts' Crumbles®



Forest Concepts' Crumbles®



Raw Corn Stover Bale



Crumbles® Switchgrass Bedding



Crumbles® Wheat Straw

- 13 US Patents issued with others pending
- 3 US Trademark Registrations:
 - SHREDZ®, US Registered Trademark No. 3,696,332, October 13,2011
 - CRUMBLES®, US Registered Trademark No. 4,045,867, October 25,2011
 - PRECISION FEEDSTOCKS®, US Registered Trademark No. 4,045,904, October 25,2011

Optimized to be:

- Reactor-ready size
- High flowability
- High uniformity

For:

- Absorbents
- Biochemical feedstocks
- Animal bedding
- Solid fuels
- Liquid biofuel feedstocks
- Biochar raw material

ELWd™ Upland Habitat

Cooperators

USFS – Chelan District

Washington Conservation Corps

ELWd Systems



ELWd™ Instream



- In-stream Habitat Features
- Bank Protection Structures
- Current Deflectors
- Digger & Ramp Logs
- Complex Cover Elements

Opportunity: Wildlife Friendly Fencing

If barbed wire was invented in 2019, public outcry and regulatory agencies would prevent its use.

Yet, public agencies and landowners build more than 3,000 miles of new barbed wire fence each year in the U.S.



Cautionary Note: At the request of and with partial funding from the BLM and National Fire Plan, Forest Concepts re-engineered old wooden fence designs to use WUI thinnings, be produced in rural small communities, and to be wildlife-friendly based on the latest science. The sponsoring Districts could not gain approval for commercial purchase because the wood fence cost more than barbed wire fences. None of the contingent values were accepted as sufficient justification.

Opportunity: Technical and Enhanced Biochar

- Optimized particle shape and size
 - Substitute for mined scoria, perlite, Styrofoam, in potting soils
 - Water filtration media to replace sand and gravel in sand filters
 - Water filter adsorbent for heavy metals in runoff
- Dopant-treated biochar feedstocks
 - Increase char yield and percentage of stable carbon for sequestration
- Infused biochar
 - Post-production infusion with fertilizers, mycorrhiza, pesticides, ...



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To know more...

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