



Wood & Biomass Utilization Discussion

Context, Supply, Markets & Processing Alternatives

GREEN WASTE AND WOOD BIOMASS
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Outline

- Definitions and Terminology
- Current Status, California Primary Processing Industry Infrastructure for Forest Trees
- Status & Trends, Southern California Primary Processing Industry Infrastructure
- Infrastructure Trends, Southern California
- Other Utilization Pathways, Old and New



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Presentation Outline

Definitions & Terminology - Introduce or refresh knowledge about general biomass energy and wood products terminology. Some terms are particularly important to understanding what is going on in CA.

Current Status –Primary processing and biomass utilization infrastructure in California, focused on Southern California

Status & Trends of Existing Infrastructure for Woody Biomass and Log Markets – Focused on Southern California.

Other Utilization Pathways, Old and New – Brief overview of some “tried-and-true”, and some of the more talked about technologies and markets.

Conclusion – What does this mean for Southern California wood utilization?



Useful Definitions and Terminology

- Biomass
- Forest Products Infrastructure
- Primary and Secondary Processing
- California-Specific Terms
- Forest Metrics and Nomenclature



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Useful Definitions and Explanations

Biomass - The term biomass refers to structural and non-structural carbohydrates and other compounds produced through photosynthesis consisting of plant materials and agricultural, industrial, and municipal wastes and residues. The components of biomass include cellulose, hemicelluloses, lignin, lipids, proteins, simple sugars, starches, water, hydrocarbons, ash and other compounds.

Forest Biomass – Byproducts or residuals from forest management and wood processing. Forest biomass direct from the woods is usually either ground or chipped (i.e. cut) into smaller particles. Processing waste includes hog fuel (includes bark), chips, sawdust and shavings.

Ag Biomass – For the purpose of this presentation, agricultural biomass includes prunings, orchard removals, and food processing residuals, such as shells, pits and hulls. Manure, corn stover, pomace (i.e. seeds, stems and skins left over from making wine) and other “wet” material are not usually included in this definition for conventional biomass energy plants in California (i.e. does not include biodigesters).

Current Status of California Wood Products Primary Processing Industry



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Photo Credits

Photo 1, Log Deck, Redwood Empire, Cloverdale (L. Swan, USFS, 7/2016)

Photo 2, Blue Stain Veneer, Roseburg Forest Products, Weed (L. Swan, USFS, 8/2016)



California Industry Infrastructure Map

Larger map is updated quarterly. There is also an interactive electronic version which includes biomass power and primary wood products processing plants, utility company service areas and other layers. Background data set is maintained in cooperative effort between UC Berkeley Biomass Center, USFS, S&PF, and CalFire. Hardcopy map version is maintained by USFS.

Link to UC Berkeley Interactive Map: http://ucanr.edu/sites/WoodyBiomass/Technical_Assistance/California_Biomass_Power_Plants/

California Wood Products Primary Processing Infrastructure (Feb 2017)

Geographic Area	Sawmills	Veneer Plants	Post & Pole	Whole Log Shavings Mill	Total
Central & North Coast	11	0	0	0	11
Northern Calif.	9	2	2	0	13
Central & Southern Sierras	4	0	0	1	5
Southern CA	1	0	0	0	1
Total	25	2	2	1	30

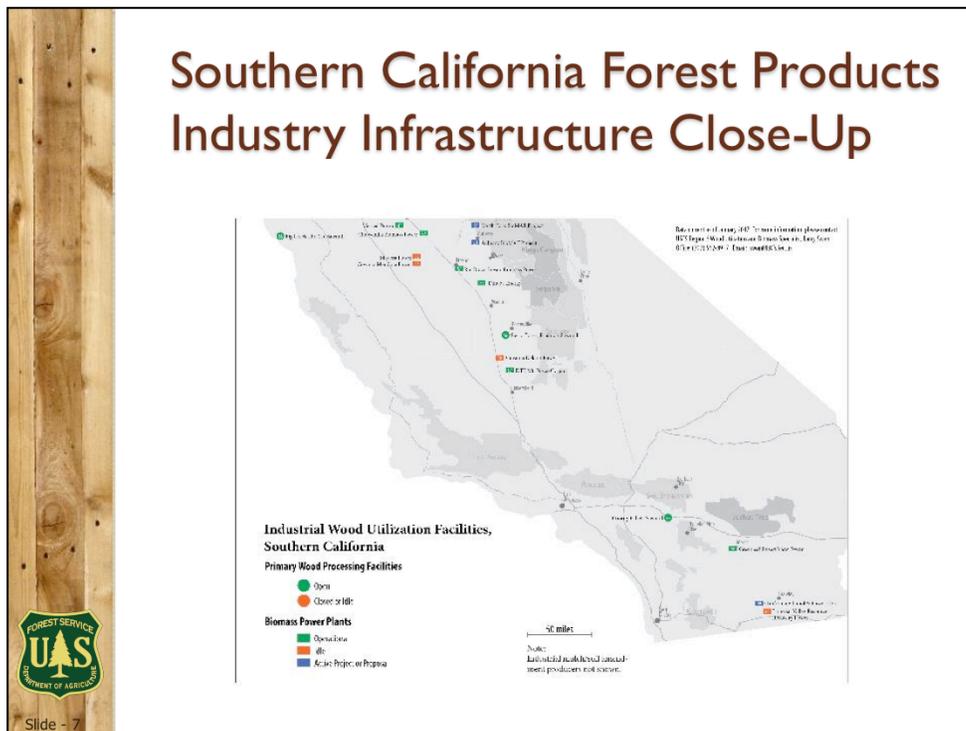


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2016 California Wood Products Primary Processing Infrastructure

Additional Observations for Central and Southern Sierras – Processing capacity is not ideally located for current tree mortality volume in Central and Southern Sierra Nevada. Central and Southern Sierra sawmills include SPI Lincoln (large and small log mills in one complex), SPI Sonora Standard (large log mill), SPI Chinese Camp (small log mill), and Sierra Forest Products (Terra Bella) (large and small log mill) (actual total primary breakdowns = 6).

Additional Observations for Southern California – The only small industrial sawmill remaining in Southern California is a Baker band saw system at Priority Pallets, Beaumont. The mill was acquired with assistance from Riverside County, using a grant from the USFS, and was commissioned in 2010.



Southern California Wood Products Industry Infrastructure Map

Sawmills – Priority Pallets (Beaumont) was already mentioned above.

Biomass Power Plants – The two key biomass power plants that take S. CA woody biomass are Desert View (Mecca) to the east and Mt Poso Co-Gen (near Bakersfield) to the north.

Mulch and Soil Amendment Industry – The mulch/soil amendment industry in Southern California is probably the largest in the Western U.S.

Firewood – Firewood remains a viable market in Southern California and absorbs thousands of cords from local producers, which is problematical when there are pests and diseases, such as GSOB (gold-spotted oak borer) and PSHB (polyphagus shothole borer).

Southern California Partial Sawmill List, 1970 - 2016

Sawmill Name	Location	Time Span	Max Daily Production (MBF)
McKeen Sawmill	Highland	Pre-1970 - 1970	20
Superior Custom Mill	Cerritos	Pre-1970 - 1975	125
Alpine Timber Products	Twin Pks	Pre-1970 - 1977	6
Golden Bear Forest Products	Redlands	Pre-1970 - 1981	100
Big Bear Timber Co. (aka Golden Bear Bldg. Products)	Redlands	Pre-1970 - 1982	60-100
Twin Peaks Timber Products	Twin Pks	1978 - 1982	8
Sierra Cedar Products	Julian	2004 - 2006	30
Forestguard	San Bernardino	2005 - 2006	50
GMA Pallets (formerly Woodwurx Corp.)	Fontana	2005 - 2008	30
Jurupa Valley Millworks	Fontana	2007 - 2008	20
Priority Pallets	Beaumont	2010 - Present	50

Note: Obtained by Rick Satomi, UC Berkeley Biomass Center, and Larry Swan, USFS, field notes.



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Southern California, Partial Historic Sawmill List, 1970 – 2016

Sawmills – Data about sawmills in S. CA were only available from 1970 to 2016. There have certainly been more small, semi-stationary mills than are indicated in this table, but it was difficult, especially pre-1970, to capture data about these mills because it was customary for small mills to cut for 3-5 years or so, and then move to another location. The maximum daily production figure should also be regarded with caution. This would be the production number if there was a experienced full crew, no breakdowns, and with “perfect” logs for the particular mill design. About half the maximum daily “potential” production might be a more accurate estimate of actual daily production, if the mill had logs. Estimates are probably more accurate from 2004 to present.



Southern California Sawmills and Markets

Current Infrastructure – According to one knowledgeable sawmill vendor, besides Priority Pallets, there are probably at least 5 other light-industrial sawmills that might still be in Southern California if they have not been exported to Mexico (production about 800 – 1,000 BF/day). At least one of these mills is operated by Arrowhead Enterprises and another is owned by West Coast Arborists. In total, there might be about 300 “small sawmills” in Southern California, but probably only 25-50 cut any amount of volume (i.e. at least 50 MBF/yr or about 300 hrs operating time/yr). The “small sawmill” category includes band mills, swing blade mills, chainsaw mills (“slabbers”), and custom-built mills. Many of the smaller mills are used only sporadically by contractors and businesses that need a sawmill or large resaw to cut timbers and cants, and the remainder are hobbyists.

Current Production Markets – Priority Pallets is cutting for pallet stock. Most other active sawyers are doing slabs, fencing, and custom milling, both with forest and urban wood. Appearance, such as figure and color, are important.

2004 – 2008 Period – The mills that operated during this period were done all

Southern California Biomass Power Plants



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S. CA Biomass Power Plants

Current Status - Both Desert View (formerly Colmac) and Mt. Poso CoGen are about 50 MW, which means they each consume at least 310,000 BDT per year (i.e. about 25,000 TL). The Desert View plant was an active buyer during the tree mortality event in 2003-2007, but the Mt Poso Co-Gen plant did not convert from coal to wood until 2011. The Mt Poso plant also uses a significant amount of ag biomass (about 40%) compared to Desert View, which probably uses less than 10%. Total biomass consumption for the two plants combined is about 700,000 BDT/yr or about 56,000 TLs. Located near the Mt Poso Plant is the Delano Biomass Power Plant, another large plant (approximately 50 MW) which is shut down because its power sales contract expired in 2016.

Trends – Both plants have long term contracts.



S CA Mulch and Soil Amendment Industry

Current Status – The mulch/soil amendment industry in Southern California is probably the largest in the Western U.S., processing well in excess of 1 million green tons of biomass every year(?), consisting of about 80% greenwaste (e.g. curbside pickup), 10% C&D, and 10% tree prunings and removals. Most of the greenwaste is probably used for ADC (Alternative Daily Cover) by landfills, with about 10% sent to biomass power plants and 10% of the cleanest biomass (e.g. tree prunings and removals from landscapers and arborists) converted into a mulch and soil amendments (e.g. different kinds of compost). The two largest companies appear to be TVI (Tierra Verde Industries, Irvine) and Viramontes Express (Corona) which together process over 400,000 green tons/year. Forest biomass is attractive because its clean, and can be converted into many higher value products where even minor contamination with plastics or metal would be a serious issue (e.g. commercial bagged mulch, playground mulch, biofilters, highway ROW mulch, etc.). The same is true for urban logs, however, there is a higher risk of tramp metal.

Trends – There appears to be more appetite for clean, forest material to make higher-value specialized mulch and soil amendments, such as playground mulch, play structure padding, trail surfacing, highway erosion control mulch,

Southern California Firewood Market



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Southern California Firewood Market

Firewood – Firewood is a viable market in Southern California and absorbs thousands of cords from local producers. However, this can be problematical when there are pests and diseases. The market in S. CA is not supplied solely by local producers and at least one major producer from N. CA reported shipping over a million bundles of firewood to S CA, which is equivalent to about 6,000 cords or about 6,000 GT. Firewood is also imported into California from out-of-state and foreign countries. Based on incomplete records from State of California Agriculture Inspection Stations and U.S. Customs data for 2011 - 2013, a minimum of 8,000 cords/yr (without "fatwood" kindling) were imported into the state, which is about 8,000 green tons. A single business that manufactures over 1,000 cords/yr is considered a large firewood business in California.



What Utilization Options are Plausible in Southern California That are Not Already Being Done?

- Post & Poles?
- Animal Bedding?
- Densified Wood Products (fuel pellets, bricks, logs and briquettes)?



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What More Could Be Done?

Post & Poles – There are currently 2 manufacturers in CA, SPI Anderson Pole Plant (utility grade pole) and Blue Lk. Roundstock (Anderson) (dba Alta California Roundwood). CA probably has largest post/pole mkt. in Western U.S. because of trellising systems used for some crops in the Central Valley. Markets in S CA for roundwood product tend to be outdoor structures (e.g. gazebos), a small amt. of furniture, and interior and exterior accents. Face challenges of insufficient supply, species and form, and specialized markets.

Animal Bedding, Whole Log Shavings Plant - The only whole log shavings plant in CA is California Wood Shavings (American Wood Fiber), Jamestown, CA. There are two whole log shavings manufacturers in Oregon, one in Redmond and the other co-located at the Bear Mountain Forest Products pellet plant in Cascade Locks. Historically, the animal bedding market on the West Coast has been served by sawmill residues (shavings), however, as the number of mills decreased, demand for shavings grew with the increasing population. A whole log shavings plant with 2 modern shavings machines can utilize over 21,000 gt/yr of logs. American Wood Fiber also runs a bagging plant in Marysville using sawmill residues.



What is Being Considered Outside of Southern California?

1. Cross-Laminated Timber (CLT)
2. Oriented Strand Board (OSB)



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Statewide Wood Industry and Technology Assessment - Special funding from the USFS was obtained to perform assessment of current deployed technology and industry in California, and what might be deployed in the near future, to increase the pace and scale of ecosystem restoration treatments. Results are posted on the National Forest Foundation web site (<https://www.nationalforests.org/who-we-are/regional-offices/california-program>) and probably the UC Berkeley Biomass Center web site (<http://ucanr.edu/sites/WoodyBiomass/>, see the Library tab).

Cross-Laminated Timbers (CLT) – Cross laminated timbers (CLT) is an engineered wood product made of directionally-alternating layers of dimensional lumber (similar to veneer layers in plywood). The development of a CLT market will be the first new use of dimensional lumber in many years. The CLT slabs can be used as is for such things as well pads and bridge decking, but also in buildings where, if properly engineered and designed, it can be installed much quicker than if standard building techniques are used (i.e. involving concrete and steel). This can add up to large cost savings, especially in urban areas. CLT is used more in Europe than the U.S. At this point, there are only about 4 plants in N America, 2 in Canada and 2 in the U.S. The two CLT plants are in the Western U.S.: D.R. Johnson, Riddle, OR, and SmartLAM, Columbia Falls, MT. Architects indicate the key factor holding back the market is lack of supply.



What Else is Being Tracked or Promoted?

1. Fast Pyrolysis, Gasification, and Portable Technologies
2. Liquid Fuels
3. Biochar
4. Nanotechnology
5. Torrefaction
6. Cement plant co-firing



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Developing Commercial Forest Biomass Technologies and Markets

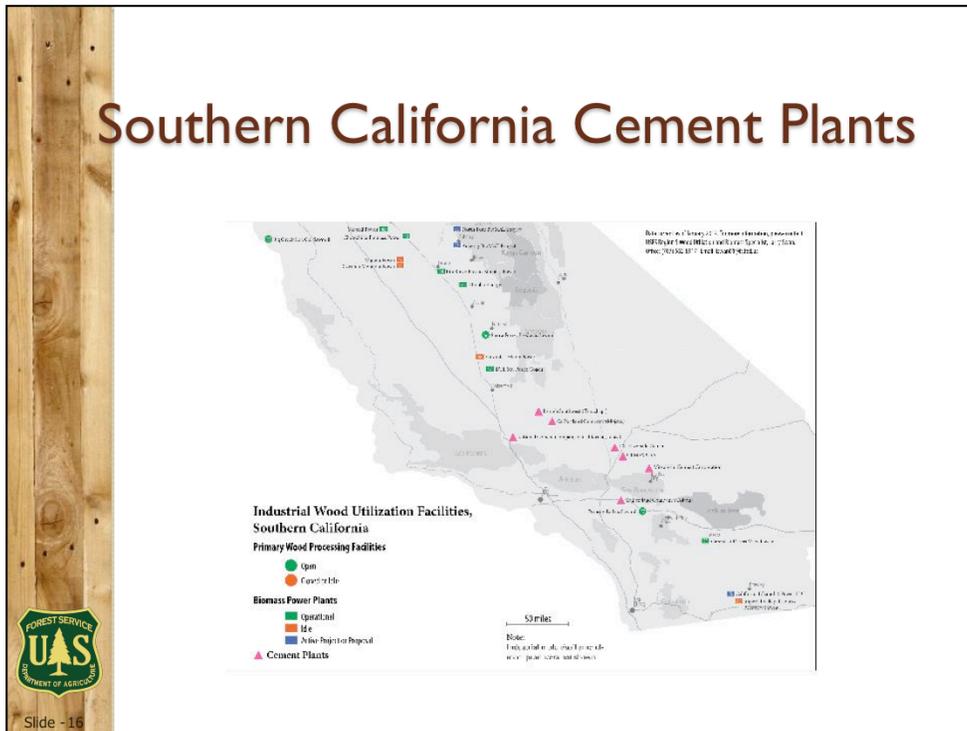
Gasification (partial air) – Gasification is not new, but it is not well-proven commercially in the U.S. at the scale needed for BioMAT projects. However, there high interest and commitments from many BioMAT projects.

Fast Pyrolysis (no air) and Liquid Fuels – Liquid fuel examples include biooil, cellulosic ethanol, butanol, and with further refining, jet fuel, diesel, and naphtha (Red Rock Biofuel example, 140,000 bdt and 15 million gallons of liquid products). No large scale commercial facilities yet operating in U.S.

Portable Technologies – Several demo. units for fast pyrolysis and gasification technologies have made inquiries about locations to operate over the last 3-4 years, but potential host responses have been restrained.

Liquid Fuels – Red Rock Biofuels (Lakeview, OR) has obtained necessary permits, but construction not yet started. Red Rock Biofuels is planning to make diesel, jet fuel, and naphtha (140,000 bdt input and 15 million gallons of liquid products output). If successful, this would be the first large scale-wood cellulose

Southern California Cement Plants



Southern California Cement Plants Map

- 1) CEMEX (Victorville)
- 2) Mitsubishi (Lucerne Valley)
- 3) CalPortland Co. (Colton)
- 4) CalPortland Co. (Mojave)
- 5) Lehigh Cement Co. (Tehachapi)
- 6) National Cement Company of California (Lebec)
- 7) TXI Riverside Cement (Oro Grande)

Cement Plant Co-Firing



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More Details about Cement Plant Co-Firing

Cement Plant Co-Firing – California has 9 cement plants, 7 of which are in S. CA. Besides natural gas, these plants are normally permitted to burn coal, low-grade oil and/or tires. At least three cement plants in S. CA utilize or are set-up to utilize some wood waste. If one of the larger ones, such as CEMEX, decided on a goal of 25% wood instead of coal, it would require about 160,000 BDT/yr (equivalent to about a 20 MW biomass power plant). Economics are a major challenge unless regulatory changes occur which require changes in feedstock, such as an stronger GHG emissions restrictions.



Conclusion

- **Competitive Market for Forest Biomass** – There is a competitive market for forest biomass and logs at this point in Southern California.
- **Restricted Markets for Greenwaste Biomass** – Greenwaste or curbside biomass appears to be the biggest biomass issue in the future because of ADC changes (by 2020).
- **Other Biomass Markets** – Other potential wood biomass markets do not appear to be suitable or large enough to absorb significant amounts of greenwaste, but there are niche markets for high-quality, clean woody biomass.
- **Cement Plant Co-Firing** – A couple of cement plants have tried a small amount of co-firing, but more work is needed to determine if greenwaste is compatible and economical.



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Conclusions



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