

Benefits of Biomass Use

Environmental

- Decrease unnaturally severe wildland fires
- Remove invasive woody species
- Fewer insect and disease outbreaks
- Protect and restore critical wildlife habitat
- Cleaner air due to decreased wildfires
- Increase longevity of landfills
- Improve vigor of remaining trees
- Reduce fire-related erosion
- Improve forest health
- Reduce dependence on fossil fuels
- Reduce greenhouse gas emissions

Economic

- Provide new jobs
- Decrease energy costs
- Provide carbon market income
- Fewer wildfires
- Reduce net cost of treatment
- Provide employment and economic stability
- Attract new industry and markets
- Avoid fire suppression and resource damage
- Pursue new incentives/opportunities (e.g., carbon trading)

Social

- Reduced threat and impact of wildfires
- Recreation/scenic opportunities
- Improved human health through better air quality
- Sustainable environments for rural communities
- Lower treatment costs with new markets

—US Forest Service

Looking for ways to use woody biomass

Woody biomass is the trees and other woody material in the forest, including the tops and limbs that remain after harvest or do not have a commercial use.

Many of the forests in California contain too much woody biomass, excessive amounts of brush and small-diameter trees that can cause damage to the forest. These overcrowded conditions cause increased competition for water and nutrients, and lead to unhealthy forests that are more prone to disease and catastrophic fire.

Due to a confluence of issues, this state of affairs has become critical. Increased small diameter vegetation in the forest, years of drought, more people living in areas adjacent to wildlands (the wildland-urban interface, or WUI), plus some of the possible results of climate change such as lengthening fire seasons, increased fire severity, and decreased snowpack, have brought the message home: we need to find ways to decrease the biomass in our forests.

Removing the excess biomass in overcrowded forests is easy in theory, but practical issues remain. How can we pay for the treatments and what do we do with all the material?

Burning the woody material from fuels reduction treatments is problematic; concerns about smoke and the risk of escape make this a less than ideal solution.

The ideal would be to find commercially viable and environmentally sustainable ways to use the small diameter vegetation.

Biomass Products

A large number of products can be made from woody biomass. These include (in order from lowest value/least processing to highest value/most processing; *from UC Cooperative Extension*):

- soil additives and amendments (mulch, compost, etc.)
- firewood and fuelwood
- combustion fuel for biomass power plants
- solid wood products (lumber and roundwood)
- densified fuels such as wood pellets and fire logs
- non-structural composit products including wood/plastic lumber and wood/cement product
- composite products such as particleboard and medium density fiberboard (MDF)
- engineered wood products such as laminated veneer lumber (LVL) and oriented-strand board (OSB)
- pulp chips for paper products
- organic chemicals including alcohol (ethanol, methanol), cellulose-based compounds, turpentine, tannins, pharmaceuticals, fragrances, and the basic building blocks for many plastics.

While feasible, many of these products have problems or undesirable traits that make them commercially inviable. In some cases the cost of transport is the limiting factor. In others it is quality. Small-diameter wood is less desirable for lumber because it warps. Using this wood in the form of poles or chopping it up for particleboard

and other reconstituted products works much better. But even when there are good uses available, competition from higher quality materials may still make woody biomass utilization economically impractical.

Cogeneration

There is a lot of interest in using woody biomass to generate energy. Biomass powerplants account for about 2 percent of the



Photo: © L. Litman

Overcrowded forests can lead to poor health, disease, and increased fire risk.



Small-diameter wood is chopped up to make particleboard and other reconstituted products.

electricity generated in California. While about 5 million bone-dry tons of biomass are used for energy each year, much of this is from agricultural wastes and sawmill residues, not forest biomass.

The California Biomass Collaborative calculates that there is enough woody biomass available to double current energy production.

Using forest biomass to generate heat and electricity solves two major problems: it gets rid of excess small diameter vegetation in the forest and can serve as a substitute for fossil fuels to generate energy, a major environmental/political issue.

Wood is a renewable energy source, and energy from biomass is considered carbon neutral. Unlike fossil fuels, such as coal and petroleum which have been sequestered for millions of years and so add to the net CO₂ in the atmosphere when released, the carbon found in woody biomass is already part of the cycle of carbon available to the atmosphere. Although recently sequestered in the plant, its release through combustion does not add to the total CO₂ in the atmosphere.

There are, however, important limitations on producing energy from woody biomass. The biggest problem is transportation; the cost of transporting the biomass to the powerplant becomes unsustainable beyond about 50 miles. One solution is to build more and smaller powerplants at a scale that can power public buildings and small communities.

The search for economically feasible uses of woody biomass continues. The future looks encouraging.

For More Information:

US Forest Service: <http://www.fs.fed.us/woodybiomass/benefits.shtml>

UC Cooperative Extension: <http://groups.ucanr.org/WoodyBiomass/Biomass%5F%26%5FSmall%5FDiameter%5FTrees/>

The language of biomass utilization

Biomass—Organic matter in trees, agricultural crops, and other living plant material made up of carbohydrates formed through photosynthesis, a natural process by which energy from the sun converts carbon dioxide and water into carbohydrates, including sugars, starches, and cellulose.

Board Foot—The amount of wood contained in an unfinished board 1-inch thick, 12 inches long, and 12 inches wide. Abbreviated “BF” Common units as related to sawlog-volume measurement include 1,000 BF or MBF and 1,000,000 BF or MMBF.

Bone Dry Ton—Traditional unit of measure used by industries (pulp/paper, biomass power) that utilize biomass as a primary raw material. One bone dry ton (BDT) is 2,000 pounds of biomass (usually in chip form) at zero-percent moisture. Typically biomass collected and processed in the forest is delivered “green” to the end use facility at 50-percent moisture. One BDT (assuming 50-percent moisture content) is two green tons (4,000 pounds at 50-percent moisture content).

British Thermal Unit (BTU)—The quantity of heat required to raise the temperature of one pound of water, 1 degree Fahrenheit.

Chip—A small piece of wood typically used in the manufacture of pulp/paper, composite panels, fuel for power/heat generation, and landscape cover/soil amendment.

Cogeneration—The combined generation of both heat and power at one facility using the same fuel source. Typically the heat is used to generate steam that is utilized onsite (process steam). Power generated is in the form of electricity that is utilized onsite or sold to a local utility.

Cull Log—Logs that do not meet certain minimum specifications for usability or grade. A cull log typically has very little value in the production of lumber products.

Gasification—The thermochemical conversion of organic solids and liquids into a producer or synthetic gas (syngas) under very controlled conditions of heat and strict control of air or oxygen.

Gasifier—A combustion device that produces biogas from solid biomass.

Generation—The process of creating electricity, typically to supply electricity to an onsite facility and/or for sale to an electric utility.

Kilowatt—A standard unit for expressing the rate of electrical output.

Megawatt—One thousand kilowatts. Enough electricity to support approximately 1,000 households.

Moisture Content—The amount of moisture contained in biomass material. Typically expressed as a percentage of total weight.

Saw Log—A log that meets minimum regional standards of diameter, length, and defect, intended for sawing into lumber products.

Volume (gross)—Measurement of log content in log-scale board foot (see board foot definition) without deduction for defect.

Volume (net)—Measurement of the actual amount of merchantable wood in log-scale board foot, after deductions for defect.

—from *Woody Biomass Utilization Desk Guide* at http://www.forestsandrangelands.gov/Woody_Biomass/documents/biomass_deskguide.pdf