

Society of American Foresters
2008 National Convention
November 8, 2008

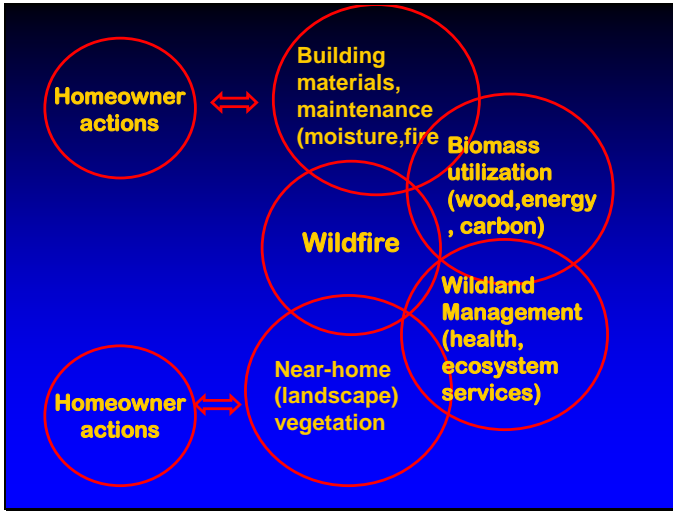
Economic and Business Trends Track

*Connecting wildfire and forest health,
biomass utilization, and carbon*

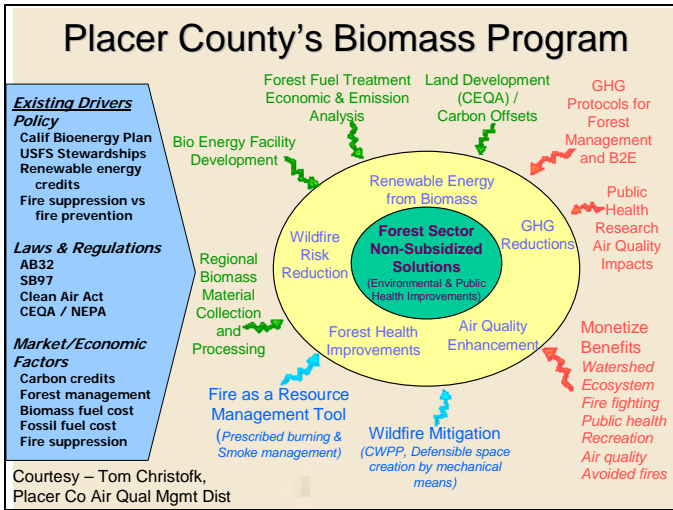
Faith Kearns, fire research
Gareth Mayhead, woody biomass specialist
Max A. Moritz, fire specialist
Gary Nakamura, forestry specialist
Steve Quarles, wood product specialist
John Shelly, woody biomass specialist
Bill Stewart, forestry specialist

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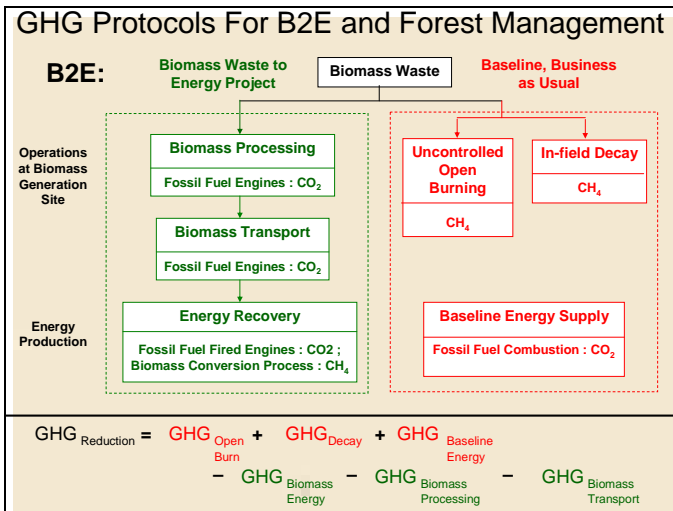


Interactions among wildfire, threat to homes, opportunities to treat vegetation to reduce fire risk and severity.



A more detailed presentation of the potential interactions among wildfire, fuel treatment, energy, economics, forest health, air quality, and carbon and climate change.

Placer County Air Pollution District



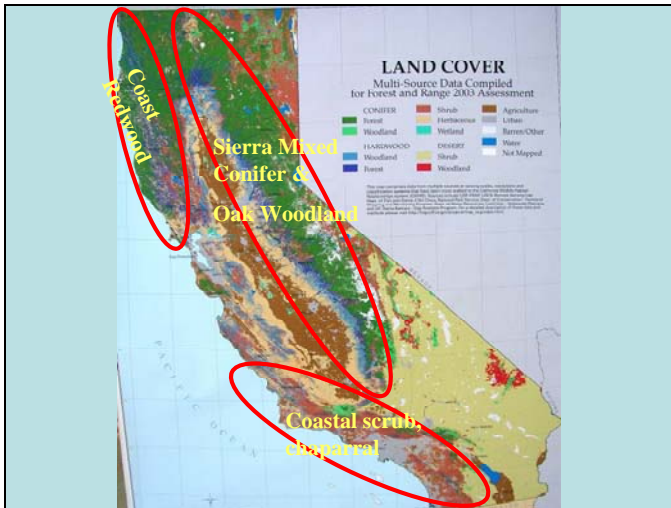
Forest biomass waste and greenhouse gas emissions – baseline carbon emissions and biomass to energy recovery; substituting carbon neutral biomass energy for high-carbon fossil fuel energy.

The Hope – a win-win situation

Biomass wildfire fuel → Biomass feedstock
 Fire hazard → Fossil fuel substitute - carbon neutral energy
 Cost to treat → Valuable – pay for fuel treatment, PCT (health, carbon)

Where and under what conditions do fuel treatments work?
 What does “work” mean for fire behavior?
 Who benefits and who should pay?

The potential opportunity to reduce wildfire risk, severity and damage while paying for the treatment



Not all biomass and fuels are created equal. California has diverse forest and other vegetation cover types. From the 2003 CDF Forest and Range Assessment, FRAP report



The people of the state are located along the coast and southern portion of the state, which have different fire regimes and fuel types, than the forested, low population parts of the state. Thus there is a difference in the costs and opportunities for effective fuel reduction treatment across the state.

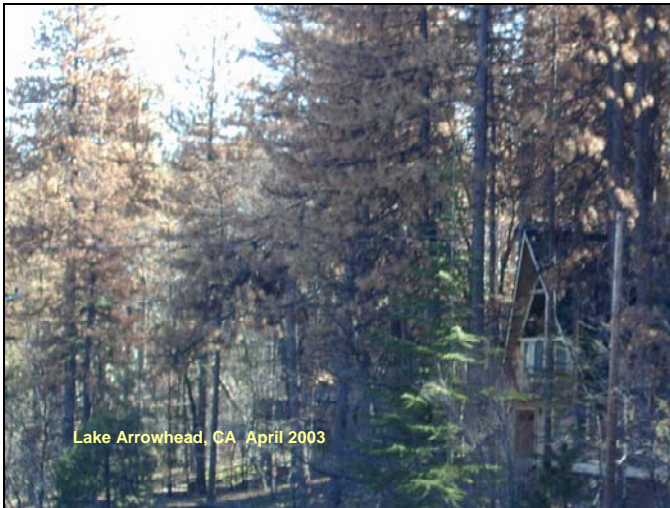


Lone Pine fuel break, Wrightwood Fire Safe Council

Chaparral is the principal hazardous fuel type in southern California. Lone Pine fuel break. Wrightwood Fire Safe Council. The fuel breaks appear to be 20 to 30 feet wide. A mosaic of brush patches were left for wildlife habitat, soil erosion protection, and other values. It is not clear how effective this pattern of treatment would be in a wildfire, whether there is sufficient distance between fuel patches on this slope to prevent the fire from jumping and igniting adjacent patches.



Southern California chaparral represents a serious wildfire hazard, but cannot be economically harvested or utilized due to low biomass per acre (high cost to gather) and lack of local processing facilities, biomass powerplants or sawmills.



Southern California wildland-urban intermix (WUI) complicates treatment of fuel and fire hazard.



Northshore, Lake Arrowhead

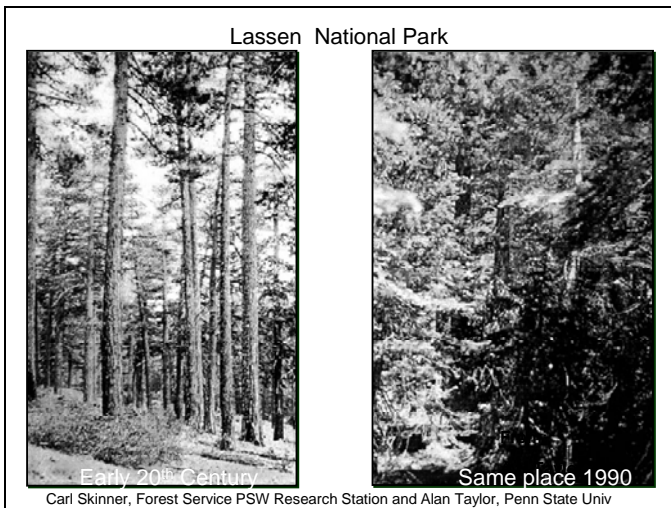
Tavern Bay

Scattered among the now dead ponderosa pine are homes, expensive homes, complicating fuel treatment, dead tree removal, and fire suppression action.



Dersch Rd, Shasta Co.
Oak woodland – grass fire

Central and northern interior California. Extensive blue oak woodland with grass understory. Increasing development, homes, WUI. Wildfire would be a grass fire, so treating the oaks would not mitigate fire behavior. Grass would not be an economically feasible biomass feedstock.



Lassen National Park

Early 20th Century

Same place 1990

Carl Skinner, Forest Service PSW Research Station and Alan Taylor, Penn State Univ

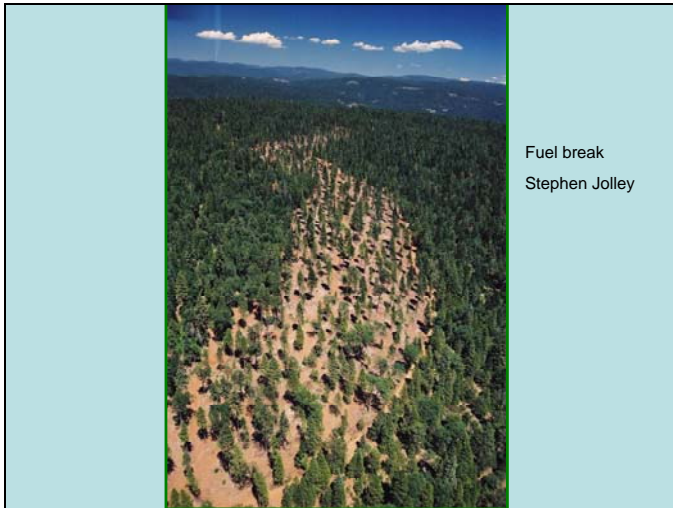
Northern California forests have become more dense over the past century due in part to successful fire suppression, resulting in high fuel loads and severe fire hazard conditions. Forest and trees do represent an economically viable fuel treatment opportunity because of the high biomass/acre and proximity to sawmills and biomass powerplants which can utilize small trees and chips.



Biomass fuel reduction treatment scenario.



Mechanized harvesting has made harvesting no-value or low-value small diameter trees economically feasible.



Shaded fuel break to bring crown fires to the surface when they might be suppressed.

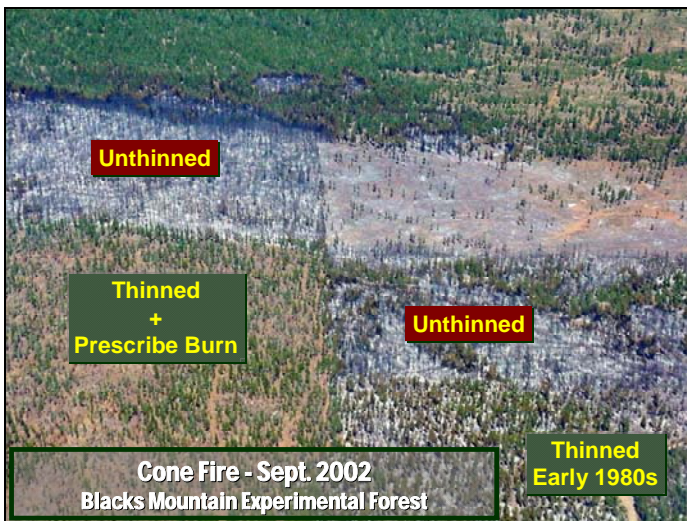


Fuel break at Angora Fire, Lake Tahoe, July 2007. Wind drive wildfire did drop out of the crowns and burn as a surface fire.



The 2002 Cone Fire in Shasta County. The wildfire burned under severe fire weather conditions – very low humidity and some winds. The wind drove the fire into some experimental plots (outlined). The white is ash on the forest floor. The left plot was thinned but the surface fuels created by the thinning were not treated with prescribed fire. The plot on the right was thinned and surface fuels were treated with a prescribed fire. Note that the plot on the right does not have white ash on the ground. The fire would not burn through this plot because there was insufficient fuel on the ground to carry the fire.

The next slide shows the upper right hand corner of the plot on the right, where the wildfire finally made its way around the experimental plots and continued to burn through untreated forest.



So, do these treatments perform as advertised? Aerial photo of the October 2002 Cone Fire at Blacks Mt Experimental Forest, Lassen National Forest. The Cone Fire burned under severe fire weather conditions – low humidity, low fuel moisture, hot temperatures, wind. The fire moved from left to right in this photo, from untreated forest into treated forest.



Burney Forest Power, Burney, CA
Chips and small logs

Thinning small trees to reduce wildfire fuels can produce wood chips for biomass fueled powerplants and small logs for lumber.



Chip van being emptied at Burney Forest Power



Burney Forest Power, Burney, CA. 30 megawatt powerplant.
Utilizes 200,000 BDT biomass/year.

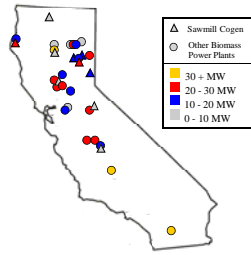
34 million BDT per year biomass available in California on a sustainable basis. About half municipal solid waste, 25% ag, and 30% forestry.

California Energy Commission report, June 2005. Biomass in California: Challenges, Opportunities, and potentials for sustainable management and development.

http://www.energy.ca.gov/pier/project_reports/CEC-500-2005-160.html

Location and size of the biomass-fueled powerplants in California consuming about 4.5 million bone dry tons (BDT) per year (J. Shelly)

California Biomass Energy Facilities



Total Capacity
~ 625 MW

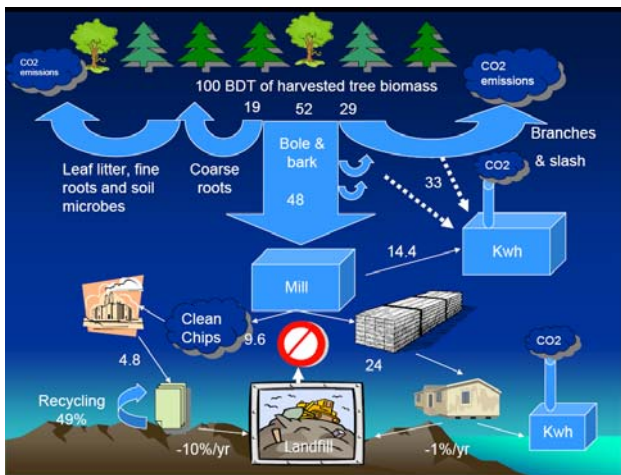
Biomass Consumption
4.5 million BDT per year
of which
22% is forest-based

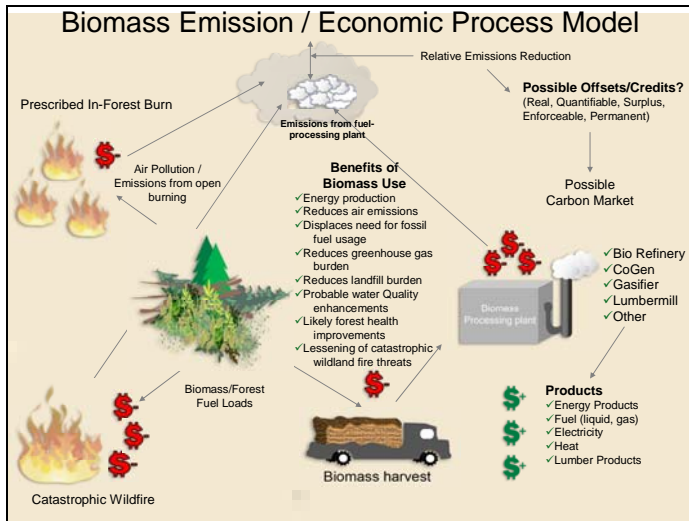
Opportunities to economically utilize biomass in California. Sawmills and biomass powerplants are scarce in the southern part of the state.



Using trees before wildfires burn them down can create green jobs, green businesses, and green electric power

What is the feasibility of this level of forest biomass utilization? What economic, ecological, and political barriers exist?





Placer County, CA. Benefits of forest biomass utilization to reduce air emissions, produce low carbon energy, improve forest health, reduce threat of catastrophic wildfire, and create “green” economy.

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Fuel treatments
<http://groups.ucanr.org/forest/>

Fire Safe construction, maintenance
<http://groups.ucanr.org/HWMG/index.cfm>

Univ. of California Woody Biomass Work Group
<http://groups.ucanr.org/WoodyBiomass/>

Fuel treatments <http://groups.ucanr.org/forest/>

Fire Safe construction, maintenance
<http://groups.ucanr.org/HWMG/index.cfm>

The Economics of Forest Health from the Community to the Atmosphere

William Stewart, Forestry Specialist, University of California Berkeley, 137 Mulford Hall, MC #3114, Berkeley, CA 94720-3114, stewart@nature.berkeley.edu

As the wildfires in western forests have become an annual televised event, the interest in the economics of forest health has increased. In addition to the conversion of healthy trees to snags and charcoal, many other negative impacts have been identified. In addition to the localized impacts to communities, vegetation and soils, the large pulses of emissions of particulates and greenhouse gases have raised the concerns of air quality regulators. Owners of downstream water diversion and supply facilities are increasingly concerned over costs and losses.

In the 'marketplace' of potential forest management projects we have many sellers of new projects that project more benefits and fewer losses. The United States Forest Service, state agencies, resource conservation districts, individual landowners, and entrepreneurial non-profit organizations are all looking for funding. However, we have not seen a similar increase in the number of buyers – in terms of investors in these projects. A review of the different types of potential benefits and the scale at which those benefits will accrue provides some useful insights into why few 'deals' seem to get completed. The many potential benefits from any specific project show up at scales ranging from individual homes that receive greater levels of fire protection to reductions in global emissions of carbon dioxide and methane. It has proved much more difficult to identify the entities that would invest in those projects now for the probability of some benefits in later years. By themselves, individual streams of benefits such as increases in fire protection to houses, reduced losses to timber resources, reduced smoke and particulate emissions, reduced sedimentation into downstream reservoirs, and reduced wildfire emissions are not sufficient to convince one type of beneficiary to fund projects. Federal and state forestry budgets are not growing to match the perceived need for funding. Coordinating potential investors in forest health projects so that they are willing to invest amounts proportional to the benefits they value will be crucial if more funds are to become available. In the fire prone forests of California, the potential benefits from protecting high value hydroelectric sites from post fire erosion and debris as well as the expanded use of forest biomass to produce renewable energy appear to be more promising investment opportunities than attempting to store forest carbon through a century or more of fire seasons.

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Woody Biomass, is it a Hazard or a Potential Resource?

John R. Shelly, UCCE Advisor – Woody Biomass Utilization, University of California at Berkeley

Gareth Mayhead – Academic Coordinator in Woody Biomass, University of California at Berkeley

The argument is often made that much of the hazardous fuel that builds up in forests could be collected and transported to companies that could convert it into usable products. This material, a form of woody biomass can be used to make a wide variety of products including:

- Soil additives and soil amendments (mulch, compost, etc.)
- Firewood
- Combustion fuel for heat and power including power plants (chips, fuel pellets, etc.)
- Pulp chips
- Solid wood products (lumber-based)
- Composite panels (oriented strand board, particleboard, etc.)
- Wood fiber/plastic composites (plastic lumber, etc.)
- Organic chemicals including alcohols (ethanol, methanol, etc.)

The product that gets the most attention is bioenergy. On the surface this seems like a “natural” solution. Improve forest health, reduce the risk of catastrophic fires, protect communities, and at the same time produce a renewable energy. However, like many seemingly simple solutions, the “devil is in the details”.

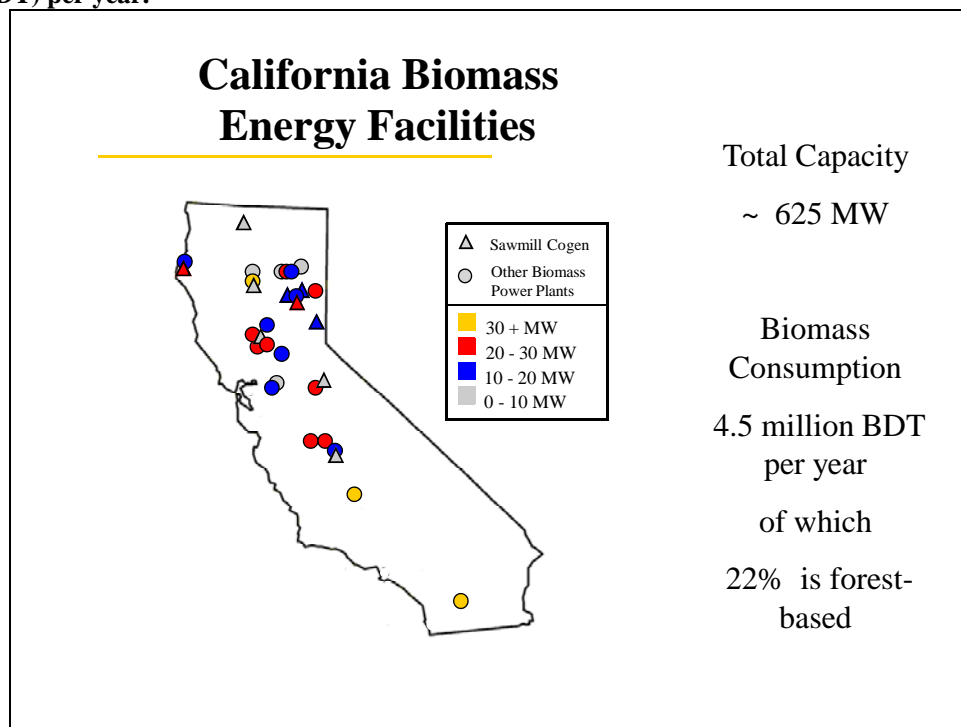
From a technology point of view bioenergy is a wise choice for using woody biomass from forests. At its basic level, biomass fueled power plants are the most forgiving use in terms of feedstock quality.¹ These power plants are designed to combust biomass and produce the heat needed to operate boilers that supply steam-driven generators are not limited to specific species, or moisture content as are most other wood products and bark is an acceptable feedstock so it does not have to be removed prior to use. Other products that may be produced require varying degrees of bark separation, feedstock cleaning, and drying –all adding costs to the process reducing its ability to compete with more traditional feedstocks.

Bio-energy can be also be produced from woody biomass through many other pathways and processes.² These alternative pathways involve an intermediate step to produce a liquid or gaseous fuel that will later be used in a combustion process to deliver the energy to an end use. Both biochemical and thermochemical methods exist for breaking down wood into constituents that can be reformulated to produce a variety of liquid fuels such as ethanol, butanol, bio-diesel, and bio-oil and gaseous fuels such as producer gas, synthesis gas, methane, and hydrogen. Many of these products themselves can be the feedstock for higher value bio-products with additional processing. One example is the Fisher-Tropsch process, a well known industry method of catalytic conversion of a synthesis gas into liquid hydrocarbon transportation fuels such as synthetic diesel or ethanol.

A strong case can be made to encourage more use of woody biomass as a feedstock for renewable energy because it is renewable and abundant (Figure 1). However, there are also some important challenges that must be addressed.³

- Wood is a relatively low energy density fuel when compared to other energy feedstocks, which leads to a high cost of procuring, processing, and transporting the feedstock.
- Although abundant, woody biomass may be difficult to obtain because of competing uses for the material or in the case of forest biomass, concerns about ecological effects, landowner desires, or remote locations.
- There is a general lack of understanding of the impacts of the conversion technologies related to energy balances and environmental carbon fluxes.

Figure 1. Location and size of the biomass-fueled powerplants in California consuming about 4.5 million bone dry tons (BDT) per year.



At present, the forest-based biomass is the least used biomass resource for bio-energy products, partly because the high costs of extraction from the forest and transport to the processing facility make it the least competitive fuel resource. However, forest-based biomass may have the largest untapped potential, especially if the increased use of this material can be linked to a value of reducing the risk of catastrophic wildfires. At the community level, there is much interest in developing local markets for biomass-based energy projects. These include the promotion of small-scale heat or heat and power systems designed for a range of customers from individual residential buildings to commercial and public buildings and even entire communities. However, many issues remain. Smaller scale systems cannot take advantage of economies of scale often making them more costly on a unit of energy basis than large scale systems. Other factors that need to be addressed are regulations that set limits on particulate emissions from combustion

systems (especially particles less than 2.5 micrometers in size –PM 2.5) and the availability of biomass needed to fuel the systems. Examples of effective systems are found in communities where the PM 2.5 particulate emissions from wood combustion are not a concern and ample woody biomass is available. Opportunities to produce a standardized fuel from woody biomass (fuel pellets) may also become more of a reality in some market areas. Fuel pellets can compete well with higher fuels such as propane, liquefied petroleum gas (lpg) and heating systems that operate on electricity.

Collaborative efforts with state and federal agencies are actively involved in assessing woody biomass opportunities, evaluating feasibility, and providing technical assistance and knowledge transfer. In addition, funding is often available to help build small-scale projects and encouraging development and demonstrations. Examples include woody biomass heat systems for commercial greenhouses and public buildings as well as demonstrations of emerging gasification technology capable of producing both heat and electricity.

References

1. David L. Nicholls, R. A. Monserud, D. P. Dykstra. 2008. Biomass Utilization for Bioenergy in the Western United States. Forest Products Journal Vol. 58, No. 1/2. <http://www.forestprod.org/janfeb08feature.pdf>
2. Jerrold E. Winandy, A. W. Rudle, R. S. Williams, and T. H. Wegner. 2008. Integrated Biomass Technologies: A future vision for optimally using wood and biomass. Forest Products Journal Vol. 58, No. 6. <http://www.forestprod.org/jun08feature.pdf>
3. Woody Biomass Utilization: Challenges and Opportunities. 2008. J.R. Shelly, M.E. Puettmann, K.E. Skog, and H. Han, Eds. Conference proceedings. Forest Products Society, Madison, WI. 102 p.