

# The Massachusetts Sustainable Forest Bioenergy Initiative

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Massachusetts offers a unique opportunity to balance population-based energy needs with land conservation and sustainable natural resource management. With a population of over 6.3 million (US Census estimate, 2005) embedded within the largest and most populated metropolitan region in the country, Massachusetts has more than 60 percent of its five million acres of land in forest. Forestland covers nearly three million acres of public and private land, with approximately one million of those acres in permanent protection from development. Across the state, the landscape contains more forests now than at any time in the past 200 years (Harvard Forest). Considering the energy needs of the population of Massachusetts and state's vast proportion of under-utilized forest land, the possibility of increased use of sustainable renewable energy, and specifically forest bioenergy, is a logical solution in addition to meeting traditional forest ecological, social, and economic considerations.

## Massachusetts forest history

The relatively diverse forests of Massachusetts are composed of tree species such as sugar maple, beech, yellow and paper birch, ash, oak, hickories, red maple, hemlock, white pine, and pitch pine. The forests of Massachusetts have been influenced by natural and human disturbances for nearly 10,000 years. Hurricanes, ice storms, tornadoes, thunderstorms, insect and disease outbreaks, fire, and climate change leave their imprint on the forested landscape. Human disturbance began with the forest use and care of the forest by Native American tribes, where hunting, gathering and limited agriculture took place. In the late 1600's, Europeans began converting the forests to agriculture, leaving less than 40% of Massachusetts land in forest (Harvard Forest). During the mid-1800s the Industrial Revolution initiated the abandonment of farming, allowing reforestation on a broad scale. Forest land continued to increase through the 20<sup>th</sup> century, until population and housing demands began to take their toll on the forest once again. Recently, increased suburbanization and second homes began a second wave of forest land use conver-

sion. Currently, Massachusetts loses approximately 40 acres of open space daily to development (MAS, 2003). This land conversion continues to have a profound effect on the amount of available forest and their associated ecological, social and economic benefits.

## Energy and impacts

As the population of Massachusetts continues to increase, energy demands, conservation, and the preservation of the planet have become important issues. Conflicting passions, needs, and values have sparked a debate over the balance of energy and conservation in the context of Massachusetts and the entire planet. Discussions concerning the future stability of economic, ecological, social needs and values in Massachusetts have resulted in modern solutions to correspond with these issues. Recognized as one of the most crucial and timely public issues is energy consumption and the call for alternative renewable fuel sources as a means of mitigating negative impacts such as poor air quality, unsustainable resource extraction and the threat of global warming.

Massachusetts residents use energy to light, heat, and cool their homes and buildings, cook, wash clothes, provide entertainment, and power their transportation. Today, the majority of electricity is generated using fossil fuels (coal, oil, and natural gas). The consumption and utilization of these non-renewable fuels has several proven consequences, particularly in the form of air pollution and the release of carbon dioxide (MTPC, 2007). Energy production and transportation as a whole accounts for essentially all of the emissions of carbon dioxide and nitrous oxide into the atmosphere. According to the Environmental Protection Agency, Massachusetts greenhouse gas emissions total approximately 21.7 million metric tons per year (federal EPA) and 185,000 tons of polluting emissions each year (MTPC, 2007).

Fossil fuels are non-renewable resources, meaning that once extracted, they cannot be replaced. The extraction

and transportation of these has already seen some major catastrophes (e.g. Exxon Valdez and locally in Buzzards Bay), and it is known that the natural supply of these products will unquestionably run dry. Additionally, the population's reliance on the use of fossil fuel-generated energy exposes us to economic impacts such as fuel supply disruption and volatile energy prices. As we continue to be universally dependent upon foreign supplies of these fuels, our energy security is not intact. This use of international sources of natural resources also calls into question the exploitation of humans and their natural resources, especially in developing nations with minimal environmental regulations.

### **Alternative: bioenergy**

In 2000, fossil fuels produced 89% of the energy in Massachusetts. Approximately 6% was generated by renewable energy sources and the remaining 5% by nuclear power. Currently, approximately 79% of the renewable energy is produced from hydropower and 21% from bioenergy, specifically wood and wood waste. The amount of renewable energy already developed in Massachusetts is encouraging, but also indicates that there is a need to increase both the quantity and availability of renewable energy sources (MTPC, 2007). The Commonwealth has four potential sources of renewable energy: existing hydropower facilities and infrastructure, wind potential in a number of areas, solar energy from solar photovoltaic installations and sustainable forest resources.

Forest bioenergy can be used to generate energy in a manner that is sustainable and climate-friendly. Forests are considered a renewable resource source because over time it is feasible to sustainably and predictably manage forest. Use of forest based resources such as the abundant, under-utilized, low quality forest material in Massachusetts forests can be used to generate power while decreasing emissions of greenhouse gases and increasing the storage of carbon. Traditionally, Massachusetts' forests have been managed for a variety of uses and activities. Today, forests could be managed for these values in addition to playing a role as a primary renewable and clean energy resource in the Commonwealth. Low quality under-utilized forest material could be harvested as a primary bioenergy source and improve the quality of the forests species composition, stocking, growth, and overall vitality. Harvesting this material could also improve the forest's ability to store carbon through carbon sequestration, and could increase storage of carbon through the production of high quality forest products.

The use of Massachusetts' forests as a source of energy production could significantly and positively affect the state directly and in several ways. Bioenergy is an abundant,

domestically available source of clean energy. As a product, bioenergy technology offers cost-competitive prices paired with significant ecological, social, and economic benefits. The use of clean energy technology could significantly reduce the negative impacts of fossil fuel emissions. Combined with the sustainable management of Massachusetts' forests, social values such as aesthetics, land conservation, and wildlife habitat protection would be maintained. In addition, renewable energy offers significant economic benefits. By utilizing local forest resources directly, we are building new social and economic opportunities and capacity by creating a number of new rural jobs. This is especially noteworthy in rural areas where there has been recent economic decline.

### **The Sustainable Forest Bioenergy Initiative**

In order for Massachusetts to successfully reduce our current dependence on fossil fuels and significantly increase sustainable, renewable, forest bioenergy, significant work in three important areas. The first priority area is the protection of a sustainable base of forests is needed. With continuing pressure for sprawl development on productive forests, a multi-faceted approach to protect the forest base is needed. This approach needs to be implemented by a broad coalition of government, non-profit, industry, and landowner organizations. The approach needs to include an array of forest conservation tools ranging from permanent conservation via working forest easements, property and state tax incentives for working forests, term easements in exchange for forest plans and innovative forest business grants and more extensive participation in the newly revised forest "current use property tax" program.

The second priority area is the strengthening of the infrastructure that assures the highest standards of sustainable forest management are practiced. This foundation is critical as we contemplate expanded harvests with emerging new energy markets in a state where the forest is increasingly surrounded by residences. In 2004, Massachusetts became the first state to achieve Forest Stewardship Council (FSC) "Green Certification" for all 500,000 acres of state-owned forest lands. More recently, Massachusetts was audited as a "group manager" by Smart-Woods for FSC "Green Certification" of the 350,000 acres in 4,500 private ownerships in the forest "current use property tax" program. If successful, this will be the largest such "group certification" in the world. This certification will supplement major revisions to the "current use" law passed in December that make the law more attractive to forest landowners and strengthen the long-term protection of enrolled forest land via a one-year extension of Massachusetts' unique "Right of First Refusal" purchase option to cities and towns when land leaves the program. In the next few months, Massachusetts also will complete com-

prehensive revisions to its Forest Cutting Practice Act regulations that will end the practice of high grading and require all cutting to be based on silvicultural principles.

The third priority area is to gather information that is essential in presenting a forest bioenergy solution to Massachusetts citizens, decision makers and the forest and energy business sectors. The Massachusetts Sustainable Forest Bioenergy Initiative is an \$800,000 federally and state funded program to prepare Massachusetts for the emergence of a forest biomass supply and energy market. To successfully promote forest resources as an environmentally sound source of renewable energy in Massachusetts, the following actions are planned:

- Conduct public outreach on sustainable forest bioenergy benefits and address public concerns;
- Conduct promotion and marketing efforts to potential developers and users of forest bioenergy;
- Assess the long-term sustainable supply of forest bioenergy resources;
- provide recommendations for sustainable forest management and forest health;
- Analyze regional economic impacts of forest bioenergy development;
- Research forest bioenergy harvesting, processing, transportation, and aggregation methods and alternatives;
- Develop a strategic plan for forest resource supply infrastructure and markets to meet forest biomass needs;
- Develop and conduct forest industry training programs on optimal forest management practices and equipment;
- Establish forest bioenergy demonstration areas for public, private and industrial landowners.
- Implement a long-term monitoring program of state "forest reserves" and "working forests" that tracks changes in key metrics over time including forest health, habitat diversity and carbon sequestration to assess changes due to management and global warming.

## Conclusion

The ability of Massachusetts to maintain a heavily forest-



ed landscape and effectively increase the use of sustainable, renewable and climate-friendly energy sources depends on progressive and innovative actions. Bioenergy can be a significant part of an increased renewable energy supply. To prepare for this evolution, Massachusetts needs to implement a broad-based approach to protect its base of forests from sprawl development. Equally important, Massachusetts needs to expand its infrastructure of standards and practices for forest management to assure all forests are well managed and in a sustainable manner. Finally, Massachusetts needs to gather information and provide education and technical assistance to the public, decision makers and the forest and energy sectors so that bioenergy can be smoothly integrated into the strong culture of forest conservation that exists in Massachusetts.

## Sources

- Harvard Forest. *Wildlands and Woodlands: A Vision for the Forests of Massachusetts*.  
Harvard University, Petersham, MA.
- Massachusetts Audubon Society. 2003. *Losing Ground at What Cost?* Massachusetts Audubon Society, Lincoln, MA.
- Massachusetts Bio-mass Energy Working Group. 2002. *The Woody Bio-mass Supply in Massachusetts: A Literature-Based Estimate*. Amherst, MA.
- Massachusetts Technology Collaborative (MTPC). 2007. *Why Clean Energy is Important: Bioenergy*. [www.mtpc.org/cleanenergy](http://www.mtpc.org/cleanenergy).
- National Association of Conservation Districts (NACD): Forest Resource Committee.  
2006. *Forestry Notes: Massachusetts Sustainable Forest Bioenergy Initiative*.
- USDA. [www.forestry.nacdnet.org](http://www.forestry.nacdnet.org).