

Meeting the Needs of Communities and Forests

*The Development of a Biomass Energy System
in Richford, Vermont*



NNFP National Community Forestry Center
Northern Forest Region

May, 2004

About the National Community Forestry Center . . .

The National Community Forestry Center (NCFC) is a decentralized network with four regional centers and a national coordinator. The four regional centers are located in the Southwest, the Appalachians, the Pacific Northwest, and the Northeast. The Northern Forest Regional Center of the NCFC is administered by Yellow Wood Associates, Inc. of St. Albans, Vermont. The Northern Forest Region, our primary area of service, comprises the states of Maine, New Hampshire, New York, and Vermont.

The core purpose of the Northern Forest Regional Center is to help rural people conduct and use research to inform decision-making about forest resources. Our goal is to add value to the work of communities, organizations, and institutions in our region who share a vision of healthy communities and healthy forests, now and for future generations.

The work of the Center includes:

- developing partnerships with existing organizations who share our vision
- assisting rural communities in defining research agendas and engaging scientists in participatory research
- conducting targeted research to address region-wide issues and opportunities
- responding to requests by rural people for information and technical assistance related to community forestry
- establishing mechanisms such as listservs, web page, newsletter, and conferences to facilitate information sharing and networking
- publishing fact sheets, reports, and other materials on forest-related topics
- working intensively with up to three communities per year based on priorities established by the Bioregional Advisory Council.

We look forward to engaging you in this unique opportunity to support rural people in creating healthy communities and healthy forests. We would be happy to respond to your inquiries about the Center's services, or about specific forest topics, and are prepared to assist you in locating forest-related information and resources.

The National Community Forestry Center is a program of the National Network of Forest Practitioners. Network members share an interest in rural community development based upon sustainable forestry, and, even more importantly, a conviction that healthy communities and healthy ecosystems are interdependent.



NNFP National Community Forestry Center

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INTRODUCTION

The Richford Wood Initiative, a grassroots group of local citizens from Richford, Vermont, has been meeting regularly since 2001 to explore ways to support the local economy, encourage sustainable management of forest resources, and develop renewable sources of energy. Too often, these goals are perceived as incompatible, however, the Richford group's efforts to pursue development of a combined heat and power plant fueled from local biomass holds significant promise for meeting all three of these goals. If successful, the Town of Richford will be the first community of its size to develop such a system in the United States.

This document summarizes the learning and insights of the group as they have explored the issues relating to the supply and harvesting of biomass from local lands. While aspects of this project require more research and development, this report frames some of the key questions that any community must answer if it is interested in developing a similar project.

The Richford Wood Initiative

The town of Richford, Vermont is located in the north central part of the state and shares a border with Canada. In the past, Richford has had a thriving wood products industry that took advantage of the extensive timber stands in eastern Franklin County. This industry was crippled in 1995 when the Sweat-Comings furniture factory in downtown Richford closed, leaving Blue Seal Feeds, an agricultural feed producer, and Kaytech, a siding manufacturer, as the town's remaining industrial entities. Now most of the wood harvested in the area is exported to create value-added products elsewhere.

In 2000, Richford embarked on a visioning process in order to identify opportunities for economic development looking forward to the year 2010. The wood products industry was specifically targeted as an opportunity for revitalization. Soon after the 2010 project, a citizen's group, called the Richford Wood Initiative (RWI), formed with four goals in mind:

- (1) provide local jobs
- (2) stimulate sustainable management of local forest resources
- (3) attract sustainable manufacturing enterprises
- (4) pursue renewable energy projects

In December 2001, RWI's fiscal agent, the Richford Economic Advancement Corporation, received support from the National Community Forestry Center, Northern Forest Region (NCFCNFR) to hire a local coordinator. NCFCNFR worked with RWI and the local coordinator to develop a participatory research workplan and to facilitate meetings of the group.



Richford Wood Initiative

Richford, Vermont



By the end of 2002, the group decided to focus its efforts on creating a combined heat and power (CHP) plant for Richford. The CHP plant would be designed to use locally culled biomass to generate electric power and to supply district heating to town buildings through a hot water pipeline system.

What is biomass?

Biomass refers to organic material that can be used as an energy source. Potential biomass sources include wood chips, bark, sawdust, waste from tree thinning, and some forms of agricultural and municipal waste. Two of the most common sources of biomass include sawmill wastes and chipped low-grade wood from logs (or parts of logs) that are not of commercial quality.

Why use biomass for community district energy systems?

District energy systems are comprised of a central heating plant that provides thermal energy to multiple buildings in a community. The thermal energy, which is in the form of hot water or steam, is distributed by underground pipelines and is extracted at the individual buildings. District heating replaces building-based boilers, furnaces, and cooling systems. In addition, the steam from district heating can be used directly by some industries in certain manufacturing processes.

District energy systems can also be designed to produce electric power. These are referred to as Combined Heat and Power plants (CHP). These plants are able to get more usable energy out of the biomass than a plant that only produces heat.

The primary benefits of using biomass as a fuel for community-based energy systems are:

- **Retain dollars in the local economy:** Using locally produced biomass can significantly increase community wealth by replacing dollars spent on fossil fuels, which are exported from the local economy, with dollars spent on fuels produced locally. Combining district heating with local biomass procurement can support and create jobs in the forestry sector. In addition, construction jobs and jobs in plant operation and system extension are created when systems are built. A 1994 study by the Northeast Regional Biomass Program found that, for every 120,000 gallons of oil displaced by biomass fuel, \$100,000 stayed in the local economy, two local jobs were created, and local and federal tax revenues went up by \$18,000.
- **Energy Security:** The use of locally managed resources for heat and power provides more energy security by using local, renewable resources in place of imported oil and gas. In many cases, biomass is also the least costly fuel available.



Northern White Cedar

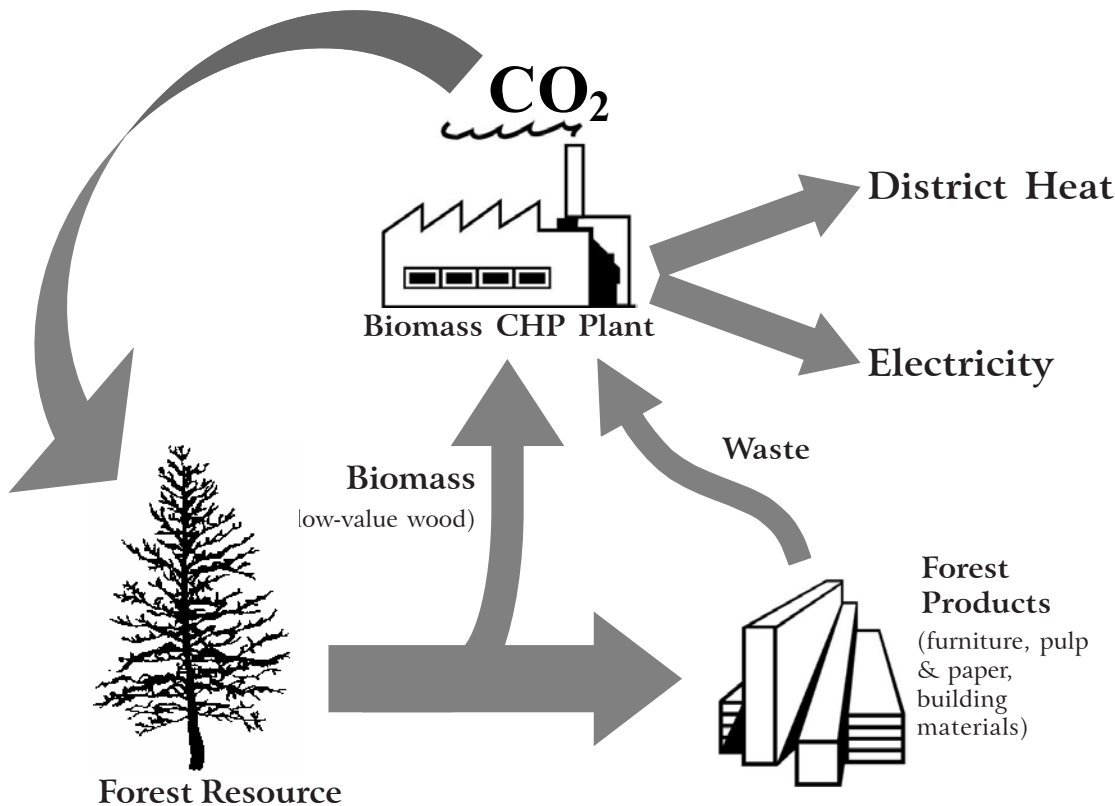
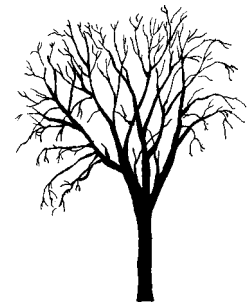


Figure 1: When low-grade wood and forest products industry wastes are burned for energy, carbon from harvested trees becomes CO₂ and is released to the atmosphere where it is recycled by living trees.



American Elm

- **Positive contribution to prevent climate change:** Biomass fuels can be a key component of a community's climate change effort, since, unlike the burning of gas oil or coal, burning sustainably procured biomass adds no net carbon dioxide to the atmosphere.

How can the harvest of biomass improve the quality and condition of the forest?

The presence of a local market for biomass helps produce healthy and productive forest lands by encouraging landowners to conduct thinning operations on their land in accordance with sustainable forestry practices. Thinning operations are part of a regular maintenance plan that removes dead, dying, and suppressed trees (biomass), which aids in promoting the growth of residual trees left in the stand. Over time, the stand will become more healthy and productive, bringing a greater return to the landowner.

When forest lands are harvested for timber, it is generally good practice to make the best possible use of all products of the harvest, while at the same time preserving the continued health of the forest resource itself. This concept is embodied in the definition of **sustainable forestry**, which seeks to provide goods and services from a forest ecosystem without degradation of the site quality, and without a decline in the yield of goods and services over time. Sustainable forest practices will also improve other forest-related values, such as recreation opportunities, aesthetics and wildlife habitat.

Pre-Feasibility Study

Late in 2003, RWI received funding support from the Biomass Energy Resource Center (BERC) in Montpelier, Vermont and the Vermont Electric Cooperative (VEC) to conduct a pre-feasibility study that will focus on two scenarios for the development of a CHP plant. The first scenario is a 250 kilowatt (kW) power plant that would supply hot water for heating for selected areas in downtown Richford. The second scenario is based on a 2 megawatt (MW) facility, which would supply electric power and thermal energy to an industrial user as well as hot water to a district heating system. The pre-feasibility study, which will be conducted in large part by BERC, will examine cutting edge technologies to be used in the plant and consider energy/heat demands and costs associated with the project.

The intended fuel for the Richford plant would be wood chips harvested in a sustainable manner from local forests. The harvesting of biomass for the CHP plant presented RWI with a unique opportunity to make a significant contribution to understanding how the plant can contribute to improved local forest health and forest value. Although the results of the pre-feasibility study will shed light on key variables of the energy project, such as the amount of wood required to fuel the different scenarios and the price that could be paid for that wood, the group was still faced with key concerns about the supply and harvesting of biomass from local lands. With this in mind, NCFNFR sought to assist RWI in identifying researchable questions so that RWI could make progress toward their goals.

DEVELOPING THE RESEARCH QUESTIONS

In collaboration with RWI, NCFNFR developed an outline of key questions regarding the supply and harvesting of local biomass. The key questions included:

1. *Is there a sufficient supply of biomass in the region to fuel a CHP plant?*
2. *What mechanisms must be in place in order to ensure that the biomass is harvested sustainably?*
3. *What are the logistical and infrastructural requirements to make this project successful?*
4. *How should the harvesting of biomass be managed?*
5. *What are the economic benefits to landowners of selling biomass to RWI?*

These questions were circulated among the RWI members, and meetings were held in September and December of 2003 and in January 2004. In addition to the RWI members, representatives from the professional forestry community, including local foresters

Kilowatt (kW) - A kilowatt is a measure of electrical power equal to 1,000 watts. A watt is the rate at which electricity is generated or consumed. Ten 100-watt bulbs use one kilowatt of electricity.



Sugar Maple

and a county forester, also attended these meetings. The participation and involvement of these individuals was critical to the development of comprehensive and realistic strategies to address the key research questions.

One of the key ingredients of the RWI's success was the commitment of the group members, many of whom had diverse backgrounds that helped sustain the project from its inception. One member, a resident of Richford, has been a professional in the energy field for many years and continues to contribute to the group's understanding of the available technologies and other technical issues related to the project. The group also includes a Vermont state legislator, forest landowners, professional foresters and other interested local residents.

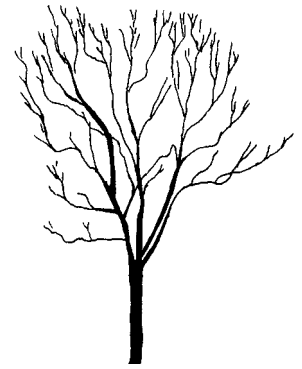
1) Is there a sufficient supply of biomass in the region to fuel a CHP plant?

The main determinant of the amount of biomass that is required by a CHP system is the size of the system itself. For the purposes of the discussion at the meetings, the 250 kW plant acted as a model from which estimates could be made about the supply of biomass.

CHP plants use, on average, 20 tons of biomass per kilowatt per year. Therefore, a 250 kW facility would require approximately 5,000 tons of biomass each year. In order to determine how much biomass for the project can be sustainably removed from forests in Richford and surrounding counties, one must know the sustainable extraction rate and the amount of land that is suitable for harvesting.

The main determinant of the extraction rate is the quality of the forest resource present at the time of harvest. For example, on lands with a profitable mix of biomass and sawlogs that have not been thinned or well-managed, the first harvest will produce a significantly greater quantity of biomass than successive harvests; estimates are approximately 3 cords/acre. For future extractions on these same lands or on lands that have been continually managed, the extraction rate is considerably less, about 1/3 cord/acre¹.

The town of Richford encompasses 26,000 acres, 15,000 to 24,000 acres of which are available forest land. Based on group members' knowledge, RWI made preliminary estimates of the amount of land suitable for biomass harvesting, which are listed below. Although there is some corporate and municipally owned forest land in the town, it is suspected that much of the biomass will be harvested from privately held lands.



Paper Birch

Estimating the Quantity of Lands Available for Harvest

One way to estimate the amount of land that could potentially be enrolled in biomass production is to obtain a copy of a tax parcel map that indicates properties that are enrolled in a state current use program. State current use programs allow enrollees to qualify for use value property taxation based on the productive value of land rather than on the traditional "highest and best" use of the land. To qualify for this designation, forest landowners must develop forest management plans, which specify when harvesting operations should occur, therefore creating a potential opportunity for obtaining biomass.

Table 1: Harvest Rate and Extraction Rate by Forest Resource Category

Forest Resource Categories (Estimates)	% of total lands	Extraction Rate (a) first extraction (b) future extractions
Lands that have been thinned and managed well	10%	1/3 cord/acre (a,b) (1 ton/acre)
Lands that have not been thinned/well-managed and have a profitable mix of biomass and sawlogs	40%	3 cords/acre (a) (9 tons/acre) 1/3 cord/acre (b) (1 ton/acre)
Lands currently not viable for biomass (brushland), but may be in the future	40%	none
Perpetual non-viable lands (due to slopes, wetlands, poor soils, etc.)	10%	none



Red Spruce

Although the figures above have not been confirmed through in-depth studies, they serve as useful “ballpark” figures for estimating the extent to which biomass can be supplied from local forest lands. From the table above, it is likely that 50% of Richford’s forest land in the near term (7,500 – 12,000 acres), could potentially supply biomass.

Of the total amount of forest land available, only a percentage of lands will likely contribute to the energy project. Using a conservative estimate of 10% of available lands, there would be between 750 and 1,200 acres available for the project. Using the lower estimate of 750 acres, approximately 150 acres of well-managed lands and 600 acres of lands that have not been well-managed would be available. Based on the different extraction rates for these lands (shown in Table 1), there may be as much as 150 tons of biomass harvested from well-managed lands, and 5,400 tons from unmanaged lands, for a combined total of 5,550 tons for the first extraction. Although preliminary in nature, these estimates indicate that the 5,000 ton requirement for a 250 kW facility would initially be met by supply from local lands during the first year of extraction.

Estimating Future Supply

After the first extraction, the proportion of managed lands to unmanaged lands will increase, which will reduce the potential harvest of biomass in future extractions. For example, assuming the low figure for available forest land in the Richford area (7,500 acres) and the estimated biomass production on those lands (20% managed, 80% non-managed), the total potential supply of biomass is 55,500 tons (1,500 tons managed, 54,000 tons unmanaged). If the

first harvest (5,000 tons) for the RWI project is taken completely from unmanaged lands, this effectively converts 556 acres (5,000 tons divided by 9 tons per acre) of unmanaged lands to managed lands. This leaves a pool of 2,056 acres in managed lands and 5,444 in unmanaged lands. Based on these numbers, the total potential biomass supply has decreased 8% to 51,052 tons since the initial harvest. As a result of declining potential production of biomass, the RWI project may need to look beyond the borders of Richford to satisfy the fuel requirements of the 250 kW plant.

As one of the next steps, RWI plans to reach out to local landowners, educate them about the program, and attempt to determine their potential willingness to harvest for biomass.

Establishing a Multi-Year Procurement Plan

Once an acre of land is harvested for timber, it will be effectively removed from the pool of harvestable land for many years to come. As a result, it is important to build in mechanisms to ensure the reliability of the biomass supply over time.

One way to ensure reliability of the fuel source is to partner with businesses or other landowners that may be able to supply biomass during times of low harvest levels. To this end, RWI met with the Atlas Timberland Partnership, a private timber company that owns land in the Richford area. Atlas has indicated its interest in supporting the RWI in a variety of ways.

Another strategy to ensure continuance of supply is to stagger supply contracts so that, in any given year, there is an adequate amount of supply. RWI will work with landowners to develop a multi-year procurement plan in order meet the needs of the system over the long term.

Minimum Requirements for Acreage/Biomass

RWI decided that there should not be a minimum requirement for acreage to be eligible for a contract; however, there should be a requirement specifying a minimum quantity of biomass that would be purchased by RWI. For landowners with small woodlots, this requirement could be met by coordinating with adjacent landowners for a combined harvest operation or by storing biomass on-site until the minimum amount was achieved.



Tamarack

2) *What mechanisms need to be in place in order to ensure that the biomass is harvested sustainably?*

The goal of sustainable forestry is to provide goods and services from a forest ecosystem without degradation of the site quality and without a decline in the yield of goods and services over time². If this goal of the RWI energy project is being met, the proportion of high quality/high value timber will increase in Richford's woodlots over time.

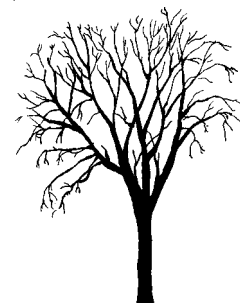
In order to ensure that biomass would be harvested in a sustainable fashion, RWI focused on developing the following components: (A) harvesting standards; (B) monitoring and enforcement; and (C) landowner education and outreach. Each of these components is discussed in detail below:

A) Harvesting Standards

Harvesting standards ensure that sustainable forest management practices are used when harvesting timber. There are a variety of standards that are used by different groups to protect various aspects of the forest environment, from water quality to wildlife. For example, all landowners who enroll in the Vermont Current Use Program are required to abide by a certain set of requirements. Burlington Electric Department, which owns and operates the McNeil Generating Plant, a 50 megawatt (MW) biomass power plant in Burlington, Vermont, has its own set of requirements. In deciding what standards are most appropriate for the project, RWI decided not to adopt pre-developed standards *carte blanche*. Instead, the group focused its energy on reviewing existing standards and assembling its own set specific to the needs of the project. The standards that the group considered include those used by the Vermont Current Use Program, Burlington Electric Department, the Vermont Family Forests Program (see page 13 for more info) and the Forest Stewardship Council.

In general, RWI members expressed concern that many landowners in Richford would be reluctant to participate if the standards were perceived as too strict. As a result, many felt that the Current Use standards were a good place to start. However, the group also agreed that there should be an option for those individuals that wished to incorporate stricter standards.

Between the second and third meetings, the forestry professionals who had been collaborating with RWI on this project met to review the different standards and develop recommendations for the



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Megawatt (MW) - A measurement of power equal to one million watts.

Forest Stewards Guild Statement of Principles

A forester's first duty is to the forest and its future. When the management directives of clients or supervisors conflict with the Mission and Principles of the Guild, and cannot be modified through dialogue and education, a forester should disassociate.

The natural forest provides a model for sustainable resource management; therefore, responsible forest management imitates nature's dynamic processes and minimizes impacts when harvesting trees and other products.

project. At the third meeting, the workgroup presented its recommendations. The recommendations included two different levels at which landowners can participate. The first level is the basic level and specifies the requirements with which all landowners must comply. The second level is the preferred level, which grants certain benefits to those landowners who wish to adopt stricter standards.

The Basic Level of Requirements

The basic requirements for selling biomass to RWI are described below:

For properties with 10 or more acres

- 1) *Have a management plan and map prepared that meets the Current Use Appraisal standards set by the state of Vermont.*

The group agreed that Current Use Standards reflect sound management practices and would also be acceptable to the general public. For a copy of the standards, see <http://www.state.vt.us/anr/fpr/forestry>.

- 2) *Timber and wood products to be harvested are marked according to the approved silviculture practices recommended in the plan.*

The group agreed that it was necessary to add language to the Current Use Standards regarding the importance of conserving wetlands and wildlife. The added language (below) has been adapted from the Vermont Family Forests Forest Management Checklist (see Preferred Level for more information about the Vermont Family Forests standards).

Harvesting and road building in areas with wetlands, raptor nests, deer wintering areas, upturned tree roots, seeps, vernal pools, hard/soft mast species, and other unique or fragile natural or cultural sites requires additional and specific precautions. Construction of new roads or expansion of the width of existing roads by more than 20% in wetlands will require a permit or review by the Wetlands Office of the Water Quality Division, (802) 241-3770. The UVM publication "Wetlands Rules and Regulations: What they mean to your logging operation in Vermont" should be referred to when building or upgrading access and managing vegetation around wetlands.

- 3) *Timber may be marked by a professional forester or a harvest manager approved by RWI. Approval requirements would include signing a statement of principles that the harvest manager agrees to follow.*



Northern White Cedar

Some landowners, although not certified as foresters, have sufficient knowledge to mark trees on their own. In order to include these individuals, the group concurred that landowners in this category should be required to agree to a set of ethical principals (such as those promulgated by the Forest Stewards Guild) and then would be subject to approval by RWI. RWI will develop a list of forest professionals for distribution to landowners to assist them in identifying qualified foresters.

- 4) *The use of necessary and applicable erosion and sedimentation control practices will be required. Every harvesting contractor will become familiar with the publication, Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont³ and will be required to implement procedures outlined in the guide to the satisfaction of the forester on the job.*

The above statement, adapted from the Burlington Electric Department's *Harvesting Policy for Whole Tree Chipping Operations in Vermont*, was added in order to ensure that proper erosion control practices were followed when harvesting biomass for the project.

For properties of less than ten acres

A management plan is not required, but the timber must be marked for cutting by an RWI-approved harvest manager.

In most situations, biomass would be harvested in combination with the harvesting of a profitable mix of timber sawlogs, since harvesting solely biomass would not likely be profitable. In general, trees that have higher and better uses should not be harvested for biomass. In some cases, however, whole tree harvesting could be used for biomass, such as the clearing of a small lot for a home site or conversion of forest land to agricultural land. Although these are not examples of sustainable harvesting, the group agreed that it would be advantageous to take advantage of the biomass being removed on these sites. Therefore, RWI created a special exception for properties less than 10 acres. For these properties, a management plan is not required, because it is neither economical nor practical. Although no forest management plan is required, landowners must have a harvest plan pre-approved by RWI.

Although some consider that this exception creates a loophole in which landowners can harvest while disregarding the standards, there are additional controls that govern these special cases. For example, state regulations govern all land use conversions from forest land to agricultural land.



Sugar Maple

A “Preferred” Level for Timberland Operators

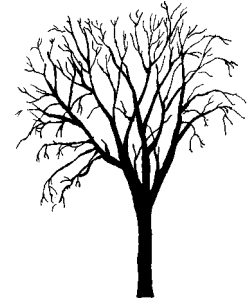
Participation at the preferred level grants certain benefits to those landowners who wish to adopt stricter standards. Landowners participating at this level would have the first option to sell wood to RWI. In addition, there may be a premium price offered to these individuals, although this would not be determined until the results of the pre-feasibility study are known. To participate at this level, landowners would be required to abide by more comprehensive management guidelines. These guidelines are based on standards developed by Vermont Family Forests (VFF). A landowner will be given preference for selling wood if they meet the following requirements.

- 1) *Have a management plan prepared by a professional forester – a member of the Society of American Foresters (SAF), Consulting Forester Association of Vermont (CFAV), or the Forest Stewards Guild. The management plan would meet the standards of Vermont Family Forests, with minor changes as noted for RWI.*
- 2) *Timber will be marked by a professional forester as described above, and marked in accordance with the management plan recommendations.*

There was some initial concern that requiring the forester to be a part of one of the three groups above may restrict some (including landowners) that have the knowledge to prepare a plan, even though they are not a member of any of the groups. However, it was generally agreed that it is a good idea to have professionals develop the plans, because they are once removed from the landowner, and, as a result, are more likely to be objective. A professional forester, one who is certified, licensed, or a member of the professional organizations mentioned above, has more knowledge of forest ecology and management than the layperson. A professional will spend far more time working and educating themselves on the latest science and practices than the layperson.

Vermont Family Forests

Vermont Family Forests (VFF) is a non-profit family forest conservation organization supported by the Addison County Forester of the Vermont Department of Forest, Parks, and Recreation; the Lewis Creek Association; the Otter Creek Audubon Society; and the Watershed Center. Its mission is to conserve the health of the forest community and, when appropriate, to promote the careful cultivation of local family forests for community benefit. VFF has developed ecological forest management practices that focus on conserving water quality, site productivity, and native biological diversity. VFF standards meet SmartWood standards, which are third-party green certification standards that help landowners differentiate between lumber harvested with no guiding ecological standards and lumber harvested from forests under ecological forest management.



American Elm

RWI also made other minor modifications to the VFF standards, which have not been included in this report.

B) Monitoring and Enforcement

In addition to the development of appropriate standards for harvesting, proper monitoring and enforcement of those standards is essential to ensuring that harvests are conducted in accordance with the project's goals. RWI chose not to require monitoring site visits for every property enrolled in the program for two reasons. First, the high cost of third-party monitoring would likely be prohibitive for many landowners, because the sale of biomass will not fetch a premium price. Second, many felt that requiring monitoring would create a disincentive for landowners who may feel that such activities impinge on their property rights. The need for monitoring and enforcement of standards is partially balanced by existing controls on the harvest:

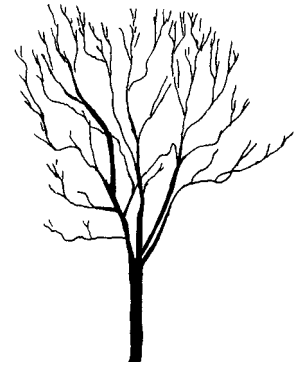
- If a professional forester is involved, there is a certain degree of control, because of their professional expertise.
- If the landowner is enrolled in the Vermont Current Use Program, then the landowner is subject to periodic state inspections.
- If the landowner is marking timber on his own, he would be bound by the ethical principles to which he agreed (see Basic Level of Requirements, Item 3).

All landowners must comply with state water quality regulations, which set forth principles and practices that must be adhered to when managing forest land. Those who violate these regulations are subject to fines imposed by the state.

Other Options for Monitoring and Enforcement of Harvesting Standards

Monitoring and enforcement of harvesting standards present a unique opportunity for a community-based participatory project, where community members themselves are engaged in the process of gaining and creating the knowledge they need. For example, local citizens could be trained to conduct spot-checks on local forest lands. Potential benefits include reduced cost and greater receptivity to spot-checks by local volunteers. In addition to collecting information on forest practices, volunteers could collect information on a range of indicators of forest health, including wildlife, and stand composition. This information could help answer important questions, such as: What is the condition of our community forest resource?

Burlington Electric Department, which operates the McNeil Generating Station, has foresters on staff that conduct periodic spot-checks and monitoring for enrolled lands. This option, called first-party certification, may become a viable option for RWI once the project is up and running.



Paper Birch

The group agreed to add the statement, “All property will be subject to third party monitoring” to both the basic and the preferred standards.

Non-Compliance

If, during a spot-check, an enrolled landowner was found to be out of compliance with the standards, it was suggested that he or she would simply be removed from the program, and thereby lose access to the local market for biomass.

C) Landowner Education/Outreach

RWI plans to develop and disseminate educational information (i.e. videos) concerning the benefits of sustainable forestry and forest landowner cooperatives, goals of the project, and proper and improper techniques for harvesting, to encourage local landowners to contribute biomass to the plan.

RWI is also planning to obtain input from local forest landowners on the standards outlined above. This feedback will help the group identify and explore potential barriers to procurement of local biomass. In some cases, landowners may not participate in the program, because it is more important for them to personally manage their own forests. For others, the cost of hiring a forester may be an obstacle.

3) What are the logistical and infrastructural requirements to make this project successful?

A CHP plant in Richford would require between 5,000 tons (250 kW) and 40,000 tons (2 MW) of biomass a year. At either of these levels of demand, there may be certain opportunities for consolidation of some timber harvesting operations. For example, an economy of scale, where fixed costs are spread over many units of production thus lowering the average cost, may result from sharing forest management or transportation costs between multiple landowners.

A consolidated operation may be managed by a landowner cooperative or run by the supervising entity for the project itself. RWI is currently investigating a centralized delivery site and sorting yard, which can help maximize the value of the harvest for participating landowners.

In such a scenario, entire timber harvests, including sawlogs and biomass, might be delivered to a centralized location, where they would be sorted and aggregated for sale. Because the yard would allow for accumulation of various products



Red Spruce

from numerous landowners, landowners who might not have enough product to justify an individual shipment to a mill could aggregate this volume with others and thus receive additional value for their harvest by marketing full loads to the highest bidder. RWI or a supervising entity for the yard would keep track of the inventory and pay individual landowners as deals were made.

Log sorting yards have been used by many communities as an economic development tool to revitalize the local forest economy. The benefits of log sorting yards include:

- Concentrating and sorting logs for higher values
- Marketing of multiple log products
- Providing opportunities for value-added operations
- Supplying a more desirable mix of products to firms.

Weighing and Chipping the Biomass

A set price would be offered per ton of biomass delivered to the centralized site. RWI is investigating the possibility of working with one of the local businesses in the area that operates scales. Weighing would be required for both pre- and post-delivery to the sorting yard in order to get reliable weight measurements of the product.

Once the biomass has been weighed, it must be converted into wood chips, the raw material used by the CHP plant. RWI has identified three chipping contractors in the area that could supply the needed services for this project. RWI has also discussed setting up routine inspections of the delivered product on-site to ensure that it meets the specifications of the chipper and the CHP plant.

Remote chipping with a portable chipper is a possibility for larger jobs, but would not be coordinated by the sponsoring entity of the project. This would be accomplished via a contract between landowner and chipper. For a typical commercial application, 300 tons (10 trailer loads) is the minimum amount of biomass harvested that would make on-site chipping a possibility.

4) How should the harvesting of biomass be managed?

Contracting with the Landowner

The group briefly considered having the sponsoring entity employ the forester, logger, and trucker and manage all operations for each harvest; however, the group decided that it would be more efficient and flexible if the landowner set up these contracts on their own. The harvesting standards developed for the project would serve as a template for the contract, to ensure that harvesting is consistent



Tamarack

with the project goals. Although anyone can sign up to provide biomass, priority will be given to contracts with Richford residents.

Development of a Local Forest Landowner Cooperative

A forest landowner cooperative is made up of a group of forest landowners who jointly manage their properties for multiple benefits. They may also co-own and/or control other forestry-related businesses that distribute benefits to members on the basis of use. There are many benefits to landowners of being a member of a forest landowner cooperative, including having conventional services provided at less cost, and having access to new services that are not normally available to the small forest landowner.

RWI is interested in the concept of a local forest cooperative to oversee the supply and harvest of biomass for the project. Independent of the development of a CHP plant, a forest cooperative can contribute to RWI's other goals of providing local jobs, stimulating sustainable management of local forest resources, and attracting sustainable manufacturing enterprises. For more information on forest landowner cooperatives, please see *So, You're Thinking of Starting a Forest Landowner Co-op* from the National Community Forestry Center, Northern Forest Region (July 2001), available online at www.ncfcnfr.net.

A forest cooperative may also allow for the management of member lands on the landscape level. Landscape forest management aims to protect important features or components of the local lands by studying harvesting options and ecosystem functioning at the landscape scale (beyond the size of individual ownerships) in the context of sustainable forest management.

5) What are the economic benefits to landowners of selling biomass to RWI?

The price that can be offered per ton of biomass will be defined by the pre-feasibility study and will be based on the cost of developing and operating the CHP plant. Although this figure is unknown at this time, RWI discussed a number of scenarios for the pricing of biomass.

The price that is paid for delivery of the biomass to a centralized delivery site for the project includes costs associated with:

- hiring a professional forester
- harvesting
- transportation from harvest site to sorting or collection yard
- chipping



Northern White Cedar

Currently, there are no pulp mills close to Richford, so the RWI project may significantly reduce product transportation costs for landowners. These potential savings would be distributed between landowners, loggers, and truckers in a free market context and would potentially allow for a greater premium to the landowner.

For the project to be successful, the price would have to be competitive with other low-grade wood markets. The other primary market for low-grade forest products is the pulp and paper industry. One of the benefits of creating a local market for biomass is that it is not as susceptible to fluctuations as the pulp and paper market, which is vulnerable to global demand and supply.

RWI is also considering setting a fixed price for biomass and negotiating contracts in the future based on this price, which would add to the stability of the local market.



As of May 2004, RWI continues to meet on a regular basis to discuss the ongoing pre-feasibility study and other issues related to the development of the combined heat and power plant, such as outreach and education to local landowners regarding sustainable forest management. For more information on the Richford Wood Initiative, please contact Colleen Pratt at 933-4692. RWI meetings are open to the public.

RWI's mailing address is:

**Richford Wood Initiative
c/o R.E.A.C.
PO Box 236
Richford, VT 05476.**

Endnotes

¹ All of these figures are estimates that were agreed upon by RWI members and attending forest professionals as general guides to calculate supply. These figures are specific to the forest types and conditions found in northern Vermont.

² Source: www.pacificforest.org/about/glossary.html

³ Vermont Agency of Natural Resources, Department of Forest, Parks, and Recreation, 1987. Available at: www.state.vt.us/anr/fpr/forestry