



Vermont Family Forests

Bicentennial Hall—Design & Construction History

Even if you don't know the story behind it, you will notice the wood inside Bicentennial Hall. The wood doesn't just serve as a neutral backdrop or an architectural accent to soften steel and concrete. Wood is featured in Bicentennial Hall. First, there is a lot of it. Second, there is variety. The unique colors, patterns and grains of various species are celebrated, making the woodwork unusual and interesting

Unlike other multi-story buildings in which you are apt to forget which floor you are on unless you look at the nameplates on the doors, the wings in Bicentennial Hall have distinct identities. While the biology department is surrounded by darkening cherry, the geology department hall is defined by lighter beech. Each wing has its own type of wood that panels the lounge and lines the lower half of the hall walls.

Behind the woodwork is a story that begins with Middlebury College's commitment to using wood from sustainably managed local forests. In order to understand what the implications of that commitment were, it's better to think of building as a verb. "You have to think of it as a process that includes materials, resources, and labor," said Dan Arons, the architect of the building process.

The building story runs backwards from the woodwork, through the architects and contractors, through the mills and dry kilns, through the loggers and foresters, to the woods. At each step of the way, business as usual was rethought and reformulated so that the wood in Bicentennial Hall reflects what Vermont's carefully managed forests could offer.

The Bicentennial Hall building story is not offered as exemplary, but rather as an opportunity to learn from the successes as well as the mistakes. Middlebury College recognized that this building would be an exploration, requiring everyone involved to be flexible, creative, and adaptive. The College also recognized the potential to create meaningful change by undertaking a process that could be evaluated and improved on. "At Middlebury we define education broadly. Everything we do is an opportunity to educate," said President John M. McCardell, Jr. in introducing the principles guiding the design process at the College.

Design

Bicentennial Hall was originally designed to use clear red oak for the panels in the Great Hall, the railings, the baseboards, and the wainscot. At first, it seemed that using sustainably grown wood would just be a matter of taking the existing plans to a different supplier. However, when the requests for bids went out, no one submitted a bid for sustainably-grown red oak to meet the specifications. At that point, the construction team had to decide whether to give up on the idea, or to make it work. They decided to make it work.

When architect Daniel Arons, of Payette Associates, tried to find out what it would take to get sustainably-grown wood, Richard Miller, of Natural Forest Products, suggested they take a walk in the woods. They walked by beech, birch and sugar maples, of varying sizes and quality, in the same stand. They saw some trees damaged by the recent ice storm. They saw streams, swamps, den trees and wet soil. They did not see a single plantation of large, clear red oak trees. In fact, according to the Forest Statistics of Vermont 2000, less than four percent of the trees in Vermont are red oak, and few of those trees would yield a high percentage of clear lumber.

So Dan redesigned the plans for woodwork to reflect what he had seen. Instead of calling for the highest grade of red oak, he considered the species, sizes and characteristics of the trees he had seen, as well as the labor required.

The most obvious change Dan made was to use seven different species of hardwoods, rather than simply using red oak throughout. The revised specifications called for beech, ash, sugar maple, red maple, cherry, or birch in the north and south wings. Red oak was only featured in the Great Hall and in the west wings.

Another change was to allow “character” wood—wood with variations in coloring or grain pattern, or with sound knots—instead of requiring uniformly clear wood. Because no one wanted to compromise the quality of Bicentennial Hall, this change in specifications required some hands-on experience. The Anthony Galluzzo Corporation made some millwork samples using the character wood. The trustees, college officials, and contractors inspected, touched and knocked on the wood until they were convinced that “character” was not a code word for “inferior.”

Once they agreed that the wood was sound as well as beautiful, the specifications for the architectural woodwork were changed from AWI (Architectural Woodwork Institute) Grade I to Grade III. This change allowed for the wood to vary in color, as it often does between the heartwood and sapwood within a single tree. It also allowed for what the grading standards call “natural growth variations” such as mineral stains or different grain patterns. And, sound knots were permitted, as long as the knots were smaller than 3/8” and not within _” of any edge of any millwork.

It has become the convention to call for uniformity of color and grain pattern in top quality wood. The AWI Grades permit more “characteristics” in the wood as the Grade drops. Yet the trustees realized, as they saw the samples, that the character wood was not only acceptable—it was worth featuring.

Size was another consideration. Some of the trees that the forest could offer, particularly those damaged by the ice storm, were smaller. While changing the width of the baseboards or trim would have meant that smaller trees could have been used, it would also have changed the look the architect was trying to achieve. Instead, the specifications were modified to allow smaller pieces of wood to be combined so that the aesthetic proportions were unchanged but the match between Bicentennial Hall and the forest was improved.

But finally, it was clear that the wood was still not going to come from a warehouse. It was to come from trees that were still standing in Vermont woodlots managed according to strict standards. The decision to use locally grown, sustainably harvested wood meant more than character. It also meant that getting the architectural millwork would take considerably more time and more work than originally envisioned, particularly when the College was also committed to using local loggers, truckers, and processors to the extent possible. Richard Miller, of Natural Forest Products, Inc. was hired to coordinate the process.

The Forest

To ensure that the wood used in Bicentennial Hall was from sustainably managed forests, Richard Miller looked for woodlots that had been certified. The Forest Stewardship Council (FSC) has developed an internationally accepted set of standards for forest management that protect the health of ecosystems, wildlife habitat, and water quality. In Vermont, FSC certification is handled by the National Wildlife Federation/SmartWood program. Natural Forest Products, Inc., was a SmartWood-certified broker.

Richard Miller worked with David Brynn of Vermont Family Forests™ to identify woodlots that could supply the wood for to meet the newly revised specifications for Bicentennial Hall. Vermont Family Forests (VFF), a non-profit organization dedicated to ecological forest management, had 31 woodlots totaling just over 5000 acres in its certified pool of well-managed forests. VFF’s basic premise is that forest management should imitate nature as much as possible. The four forests chosen to supply wood for Bicentennial Hall were not only SmartWood certified, but also managed according to the more rigorous principles and practices adopted by VFF. The management of VFF land is designed to:

- maintain soil productivity
- protect water quality, wetlands and riparian zones

- conserve and enhance habitats that support a full range of native flora and fauna
- protect unique or fragile areas.

VFF adopted [timber management practices](#)¹ to make sure the four principles are actually reflected in on-the-ground work.

All VFF parcels have written management plans that keep an eye on the long-term while prescribing the cuts that can take place appropriately. However, no forester can predict the future. In the winter of 1998, after a severe ice storm, six Vermont counties were declared federal disaster areas. In three of the four VFF parcels that ended up supplying wood to Bicentennial Hall, trees were broken and tipped during the storm by a combination of heavy ice and wind. One parcel was so severely damaged that the management plan, originally prescribing a thinning, was amended to prescribe a shelterwood cut to finish what nature had initiated.

About 70 percent of the 125,000 feet of wood that went into the architectural millwork in Bicentennial Hall came from VFF woodlots that were located within 33 miles of Middlebury. Middlebury College agreed to purchase all the wood that could be appropriately harvested from the tracts at that time—not just the top quality wood that was needed for Bicentennial Hall. The following practices were adhered to in the four VFF timber sales that supplied the wood for Bicentennial Hall:

- To reduce rutting and soil damage, logs were hauled and removed only when the ground was dry.
- To reduce soil erosion and to maintain water quality, skid trails, truck roads, and log landings were carefully planned and located and drained, according to the Vermont Acceptable Management Practices (AMP's).
- To prevent soil erosion, no trees were felled on steep slopes (exceeding 60%).
- To disturb the soil as little as possible, small equipment such as four-wheel drive farm tractors and horses were used on three of the sales to disturb the soil as little as possible. A highly competent skidder operator with a long history of careful harvesting was used on the fourth.
- To maintain soil productivity and to trap sediments and nutrients, all branches and tops smaller than 3 inches in diameter were left on the site.
- To maintain stream temperatures, to trap sediments and nutrients before they reached the streams, and to maintain continuous habitat, protective strips were maintained around the surface waters. Disturbance of the ground and vegetation in these strips was minimal; they have nearly complete canopy closure and many mature trees.
- To maintain habitat as well as to protect soil and water, clear-cutting was avoided. The preferred methods of harvest were single-tree, small-group (up to one acre) selection, and irregular shelterwood.

¹ <http://www.familyforests.org/tech.html>

- To keep the forest from becoming “oversimplified,” biological legacies of the forest community were left in place. These included coarse dead wood, logs, and snags; trees that are large, living and old; buried seeds; soil organic matter; invertebrates; sprouting plants; and mycorrhizal fungi.
- To maintain or increase the diversity of species, thinning was designed to retain and often enhance the seed bearing capacity of poorly represented tree species—such as cherry and hemlock.
- To maintain habitat, cavity, snag and large down trees were left on the site.
- Identified important natural communities were avoided. These included those ranked as “very rare” (S1) and “rare” (S2). It also included those that had little or no evidence of past human disturbance that were ranked as “uncommon” (S3), “common” (S4) and “very common” (S5).
- Sensitive and special habitat areas--such as wetlands, raptor nests, upturned tree roots, seeps and vernal pools—were identified and avoided

The standard way of compensating both the landowner and the logger for timber is on a board foot basis. Both the quality of the logs and the volume are measured. The more high-quality board feet removed per acre, the greater the landowner’s return. The more high-quality board feet removed per hour, the greater the logger’s return.

But the VFF practices listed above meant that fewer trees were cut per acre, which would reduce the landowner’s return. The practices also meant that more care and time were required in moving equipment through the forest and harvesting the trees, both of which would reduce the logger’s return.

Certainly no management standards can be sustainable if the landowners and loggers can’t afford to adhere by them. VFF founder David Brynn often quotes noted farmer and philosopher Wendell Berry who said that the two greatest ruiners of land are ignorance and economic constraint.² VFF is dedicated to reducing both constraints. Because of Middlebury College’s commitment to sustainable forest management, the project began with the agreement to pay landowners approximately twice the going rate per board foot. The extra return not only pays for the reduced yield, but it also allows landowners to invest in other management activities that do not pay for themselves in the short term.

According to the same philosophy, loggers were paid more and differently. Loggers are often hired by the mill and paid based on both the quality and the quantity of what they cut—which may be an incentive to take the best and what is easiest to remove. In this case the loggers were hired jointly by the landowner and Natural Forest Products, and they were paid 1.6 times to going rate based only on quantity—not quality. It was clear that what they left in the woods was as important as what they removed.

² Berry, Wendell. 1995. *Another Turn of the Crank*. Washington, D.C.: Counterpoint. p. 57.

In most timber sales, the logs are sent to the sawmill where the quality and quantity are determined. The mill determines what they have received and what they will pay. According to Bill Torrey, from Jericho Vermont, who logged two Bristol woodlots to supply Bicentennial Hall, “it’s like telling Home Depot deliver some 2X4’s to your yard and that you’ll look them over and decide what you will pay them.”

In the VFF timber sales for Bicentennial Hall, the log quality and quantity were determined on the log landing by the logger, forester, and purchasing agency. This arrangement dramatically improved the communication. It also gave the loggers much more control and involvement than is normal. This was the first time that Bill Torrey had rethought the process, but he now routinely scales his logs before delivering them to the mill. He has found that he is now paid for 300 to 500 more feet per load.

Although most of the wood came from VFF land within 30 miles of the College, to fill the large request within the tight time frame, some logs came from parcels in southern Vermont, some (mostly oak) came from Maine, and some (mostly cherry and tulip poplar) came from Pennsylvania. All logs were certified.

When the logs were loaded on to the trucks at the different local woodlots, the forests were in great shape; waterbars were in place; and the landowners and loggers were paid adequately for their extra efforts. The boosts in returns to the landowners and loggers are significant—making careful management both profitable and attractive. Although this increased payment for logs is substantial in terms of influencing land management, it represents less than five percent of the value of the finished millwork.

This is generally true in Vermont; because the return to the land represents a small proportion of the total value of the wood products, significant increases in the amount paid for the logs and returned to the land, if passed through to the consumer, would result in only small increases in the cost of the final wood product.

In 1998, according to the Vermont Forest Resources Plan, landowners received about \$30,000,000 in stumpage payments. This represented less than 3% of the total value of shipments

This in-the-woods portion of the building process was clearly a success.

Making the Woodwork

In choosing wood for Bicentennial Hall, Middlebury College’s commitment was twofold: first to sustainable forest management, and second to the local economy. Once the trees had been harvested, the logs had to be moved to sawmills and then to kilns before boards could reach the company responsible for the final millwork. The wood needed to be tracked and processed by certified companies so that the College could be assured that it

actually was the wood from the sustainably managed forests that emerged from the mills and ended up in Bicentennial Hall.

Natural Forest Products (NFP), who purchased the logs directly from the landowners, continued to own the wood until the final delivery to the Anthony Galluzzo Corporation for millwork. Various companies were contracted by NFP to transform the logs into boards. Because the local market for certified sustainably harvested wood has not been well established in New England, and because the timetable was tight, this orchestration was challenging.

To meet the commitment to sustainably grown wood, each firm that was hired to handle the wood had to be certified. Although certification of land entails adherence to principles and criteria, certification of processing operations means that the certified wood must be tracked and be kept separate from non-certified wood. Natural Forest Products was authorized by SmartWood to certify various processors for Bicentennial Hall job once the mechanics for segregating the certified wood had been established.

Some of the logs were sawn by Palmer and Hurley Sawmill in Riverton, Vermont, but most of the logs were trucked, by firms hired by NFP, to Lashway Sawmill in western Massachusetts. Although both sawmills had to be certified for this job, the certification was not difficult. At Lashway Sawmill, because the volume of wood was great enough, they simply cleared the mill out before beginning the Bicentennial Hall project. “It was a ten-minute job,” according to mill owner Jerry Lashway.

For Lashway Sawmill, the only tricky parts of the job were the different types of cuts specified by the architect (quarter-sawn oak) and the tight timetable.

From the two sawmills, some of the wood was trucked to five different dry kilns—three in Vermont and two in Massachusetts—where the certified boards had to be kept separate. The challenge at the kilns was pile management. The different species and different sizes of boards required different drying schedules. The volume of wood to be dried and the time frame meant that NFP had to deal with multiple kilns, but it also meant that segregation was not a problem because the certified wood utilized the full capacity of the kiln. The dry kilns were certified by SmartWood, through the agreement with NFP.

As lumber left the five dry kilns, NFP hired truckers to transport it to rented warehouse space in Burlington. The wood was sorted, graded, and stored until Anthony Galluzzo Corporation, the architectural woodworking firm, was ready for it.

The oak veneer featured in the Great Hall could not be fully produced locally from certified wood. Although some of the oak trees came from a VFF parcel, some certified oak came from Maine. The veneer logs from all sources were purchased by NFP and trucked to Lashway Sawmill, where they were cut into planks. From there, NFP trucked

the green lumber to Oak Hill Veneer in Pennsylvania, a firm that was certified by SmartWood through its agreement with NFP. At Oak Hill Veneer, the planks were sliced into veneer pieces only 1/20th of an inch thick. The raw veneer was then spliced to make panel faces.

Unable to find a local firm that would make the panels, Richard Miller shipped the raw veneer faces to Columbia Forest Products, a certified firm in Oregon for which this was the first order for certified plywood. However, only a portion of the core stock came from a certified source—Collins Pine of Oregon. Columbia purchased both certified and non-certified core stock and applied the certified panel faces to make the veneer panels. NFP was charged for the core stock and for the construction of the panels.

The final architectural millwork was fabricated at the Anthony Galluzzo Corporation in Londonderry, New Hampshire. The mill was certified for this job by SmartWood, through the outsourcing agreement with NFP. In general, there were few problems meeting the architect's specifications, although Joe Galluzzo points out how important it is to explain the expectations, up front, to everyone who will handle the wood. Because this project was "flying fast," as Joe put it, there were occasions where people were uncomfortable with the staining or character because it was not what they were used to. In addition, there were instances where size—rather than character—required changing specifications. In those cases, change orders were issued and pieces were glued to make up a larger piece.

Because the general contractors, Barr and Barr in Middlebury, had participated in all the discussions and overseen all the changes that the sustainable wood decision had brought about, by the time the finished millwork arrived in Middlebury, the installation process went smoothly.

Between woodlot and the Anthony Galluzzo Company, the wood moved through the standard steps of value adding, performed by existing businesses. However, the way the Bicentennial Hall wood moved through these steps was not standard. This portion of the building process had many strengths, but it also demonstrates the extra efforts required the first time through.

One of the most difficult and unusual aspects of the project was that NFP (with financing from Middlebury College) bought the logs and owned all the wood products, except the panel core, moving the pieces through the process. The sawing, trucking, drying, and veneer work were done by about 40 different companies, all contracted by NFP. NFP's Richard Miller was credited with performing a superhuman job scheduling, making all the arrangements for certification, and often chaperoning the wood as it moved from the forest to kilns to sawmills to storage to the Anthony Galluzzo Corporation. It was rumored that he slept in his truck. "I knew it could be done," he said. "It just takes a lot of work the first time."

While Richard's role was absolutely crucial in the Bicentennial Hall project, it should not be necessary once the market for sustainable wood is better established. A strong and steady demand for wood from local sustainably managed forests should be enough to inspire local businesses to participate, either individually or in cooperation with others, in moving the wood from the forests to the contractors.

Although the idea was to keep the building project as local as possible, the wood went out of state for most of the key value adding work. With the possible exception veneer, much of the work theoretically could be done in Vermont. In some cases, the work went out of state due to the tight time frame. In addition, there were local companies that did not want to be involved. Some were opposed to certification, perhaps because it implies that uncertified wood is inferior. Others were reluctant to simply provide a service because they have less control and/or because they prefer to make a profit on buying the materials, adding value, marketing and selling the finished product.

Keeping the wood closer to Middlebury would reduce transportation costs, but, more important, it would be a significant boost to the local economy and help build local capacity to serve a market for certified wood products.

Another complication in the Bicentennial Hall project was that, in order to take what the forest had to offer, Middlebury College bought wood that wasn't needed for the building. In a more conventional marketplace, logs are delivered to a sawmill where they are sorted by grade and species, sawn into lumber, and sorted again to fill a wide variety of orders. The extra wood that was purchased in the Bicentennial Hall project was either retained by the College for future projects or resold. If the market for sustainable wood were better established, the market -- rather than a single project -- could match the use of wood to the availability. This would require aggregation, sorting, and a more markets for certified wood.

Throughout the various stages of converting the logs to millwork, people were asked to do things slightly differently. In general, once they understood that the purpose was to use local wood, to demonstrate its beauty, and to help both the local economy and ecology, they set about their work as usual--with perhaps more curiosity and interest in the job and with more pride in the final product.

Those who handled the wood seemed to have an unusual sense of ownership of the final product. Some of the satisfaction may be due to working with local, sustainably grown wood, and therefore an increased market for sustainable wood may have the benefit of making woodworkers feel better about their work. However, it is clear that people who worked with the wood liked the idea of knowing where the wood came from and where it was going. Maintaining this link is certainly possible in a custom job where the trees are identified on the ground and carried through the process as was done in Bicentennial

Hall. But it may also be possible in a more mainstream setting if the identity of the woodlot, as well as whether or not the wood is certified, were automatically tracked throughout the value-adding process. Then, contractors could enter the value-adding process at the end, and purchase boards that would come with official papers—woodlot name, certified management, log load, even tree name.

The Building

The College's first commitment was to use sustainably grown wood. This commitment gave a boost to Vermont Family Forests, a fledgling organization dedicated to sound forest management. Not only were the participating landowners financially rewarded for their management efforts, but the beauty of the wood in the building exceeded expectations. The success and publicity of the project gave credibility to the idea that customers can support ecologically sustainable timber management in local woodlots through thoughtful purchasing.

Middlebury College's second commitment was to strengthen the local economy. First, landowners and loggers received a better return for the wood, allowing more care to be taken in the forest. Second, the project employed many small businesses, including: five private foresters, seven trucking firms, five kiln drying operations, and three sawmills.

It is difficult to measure the overall economic effect of Middlebury College's commitment to the local economy—particularly since most of the processing was not local. However, the U.S. Bureau of Economic Analysis estimates that, for every additional \$1 of millwork or veneer produced, about \$2.40 worth of output is directly or indirectly required.³ For the Bicentennial Hall project, this amounted to about \$3.5 million for architectural woodwork alone. As the process becomes more mainstream, more and more of this multiplier may be captured by the local economy.

But what is perhaps more significant to the local economy is what this project may have done for the future. At this point in Vermont, the market for sustainably grown wood is in its infancy, and the capacity for adding value to certified wood is limited. Bicentennial Hall will make future sustainable-wood projects easier in the area, partly because many of the firms are now experienced, and partly because others will learn from the successful effort.

All of the people interviewed who worked in their unique capacities on the wood said that they would do it again. Many of them were eloquent in expressing the satisfaction they had knowing that they were doing the right thing. Sawyer Jerry Lashway, for example, estimates that he didn't receive a premium for dealing with the sustainable

³ U. S. Department of Commerce. Bureau of Economic Analysis. 1998. Benchmark Input-Output Accounts of the United States, 1992. From Table 4A showing output requirements, direct and indirect, per dollar of delivery to final demand, at producers' prices.

wood. In fact, he guesses that he made less than usual on the quarter-sawn oak. “But,” he said, “How many dollars do you put on doing the right thing with the land. Isn’t that priceless?”

Logger Bill Torrey took a tour of Bicentennial Hall and commented: “I got a kick out of the fact that I could trace the boards back to the woods they came from. It snapped my garter.”

Mark McElroy, of Barr and Barr, pointed out that some of the people working with the wood were initially taken aback. “But by the end of the process they realized that it takes a better eye, more creativity and a higher level of craftsmanship to make the most of the wood, and they came away with a sense of pride in what they had done.”

The Bicentennial Hall effort began to open channels for the manufacturing of wood products that can be certified as coming from sustainably managed forests. The process, requiring NFP and/or Middlebury College to buy all the logs up front and carry them through the process, is probably not the ideal model. However, Middlebury College was willing to take on the risk and expense of beginning to establish a new market. The success of the final product has already spurred interest in building with sustainably grown local wood, and a project is underway to help firms that are interested in participating in the value-adding chain of certified wood.

Above all, the woodwork chosen for Bicentennial Hall reflects Middlebury College’s commitment to education. When students, staff and visitors hear that the wood they are looking at was sustainably grown and harvested in local family forests, the connection between the building, the College, the community, and the forest becomes explicit. The building serves as a testimonial to the commitment of the College.

In addition, the building showcases the beauty, durability and warmth of local character wood. While the trustees could only look at sample mock-ups to imagine what the wainscot and walls would eventually look like, people can now roam the halls to see for themselves whether they like the mix of light and dark cherry, or whether the maple streaks are interesting. Because people like what they see, Bicentennial Hall is influencing the market for character wood. Enthusiasm for Bicentennial Hall’s walls led Middlebury College to design local wood in its next new building—from the beginning.

While the building itself will continue to teach, the process of getting the wood from the forest to the building was a learning experience for all the people involved—and it will also be a learning experience for others who are interested in similar projects. Because this hadn’t been done before, everyone had to be particularly creative and dedicated to make it work. “It was definitely a labor of love,” according to architect Dan Arons. All the participants have learned from their experience.

It is clear that sustainably grown local wood is now paneling the walls of Bicentennial Hall because of a firm commitment by Middlebury College and extraordinary efforts of many people, including architects, foresters, loggers, sawyers, contractors, and millworkers. This is certainly not easily duplicated. The next step is to scrutinize the lessons learned from Bicentennial Hall and adjust and improve on the process so that more Vermont buildings will be able to use locally produced millwork from sustainably managed Vermont family forests