Backfill

An Architecture of Trees

The Chrysalis residence, near Avalanche, Wis., was built with small trees harvested from the immediate surroundings.

Architect Roald Gundersen and his team at Whole Tree Architecture and Construction are all for putting small-diameter trees — the "weeds" of the forest — to practical use. Forests need thinning to grow healthy stands of millable trees, Gundersen observes, and his company works with "the waste product" of that process.

Studies by the USDA-funded Forest Products Laboratory have found that a small round timber is 50 percent stronger in bending than an equivalent cross-sectional area of milled lumber. Gundersen's work takes advantage of that attribute: "We're looking at the architecture of trees, the result of 200 million years of environmental testing, and using their branching and curved aspects to reinforce our structures. From a single arched member, you can get lateral bracing in X, Y, and Z directions. A 12-inch round column is able to support a tremendous load and yet still isn't considered a millable timber." Typically, his columns and beams range between 10 and 14 inches in diameter; a rough rule of thumb specifies an inch of diameter for every foot of span. Rafters tend to be lighter, from 5 to 7 inches across.

Roald Gundersen's timber frames exploit the natural form and inherent strength of small trees. The architect (shown in his office, above left) uses small-diameter trees to support structures from the interior, permitting large daylight openings (above). Peeling the bark while the tree is still standing allows slow, even drying and completely kills the tree, helping nearby millable timber to flourish (left).

All photos by Paul Kelley

One goal of Whole Tree's work is to establish a broader industry that accepts and exploits this highly accessible framing material. But as building materials go, trees are irregular, unpredictable things. "Up until the last eight years, a lot of the work I'd done was wild-crafting," Gundersen says. "I'd have a piece in mind and go into the woods, walk and walk and eventually find it, or maybe not. So now, we bend trees into the shapes we want for particular components, a few years before we harvest them. The tree actually grows stronger in the direction of the stress." On his own 134-acre Wisconsin woodlot, he has upwards of 1,000 potential structural members cataloged and marked by GPS coordinates, ready for use.

While conventional timber framing tends to be beyond the average budget, Gundersen's homes are surprisingly affordable. "I don't think we've built anything that's been higher than $100 per square foot," he says. That, coupled with the environmental appeal of Whole Tree's work, has attracted broad interest, from commercial and institutional as well as residential clients. "Last year was our busiest design year," Gundersen notes, "and this year looks to be our busiest for construction."

— Dave Holbrook