Could research and development provide a way, or even a variety of ways, out of logging’s wood chip woes? There are some hopeful signs – albeit cautiously hopeful.

Wood chips are logging’s lowest common denominator, the cheap baseline product supporting economic viability. This was all well and good when an abundance of paper mills in Maine and elsewhere in the Northeast created a good market for wood chips. But the closure of nearly all of those mills led to a super-abundance of wood chips and very few places to sell them. The market for chips created by biomass energy plants and biomass heating at institutions such as schools and hospitals made up some of the difference, but biomass energy plants in particular have been having a rocky road, politically.

In New Hampshire, for example, the legislative battle to support biomass energy continues with extraordinary ferocity, and as a result of the turmoil, the wood chip problem there has become acute. Indeed, in New Hampshire alone, two-thirds of all standing timber is rated low-grade, or unsuitable for lumber, and 40 percent of all the timber harvested in the state is chipped. Chipping this low-grade wood is the only economically viable alternative to high-grade logging, which over time leads to weakened forests and even poorer timber supply. As the New Hampshire Timberland Owners Association has pointed out, without markets for low-grade timber, the economics of sustainable forestry fall apart.

So, with the paper mills largely disappeared and the future of biomass energy in question, what will save wood chips?
“THE RESULTS DEMONSTRATED THAT EXPANDING BIOFUELS AND BIOPRODUCTS PRODUCTION USING RENEWABLE FOREST BIOMASS AS FEEDSTOCK CONTRIBUTES TO NOT ONLY ALTERNATIVES TO FOSSIL FUELS, BUT ALSO FACILITATES FOREST RESTORATION TREATMENTS BY PROVIDING NEW MARKETS FOR MANAGEMENT OF WOODY BIOMASS RESIDUES.”
Several research studies suggest low-grade wood has a future in agriculture as a soil supplement. The U.S. Forest Service has been actively studying how to make activated carbon (AC) products from renewable woody biomass material such as forest or mill residues for technology potential and environmental benefit with a comparison to commercial coal-activated carbon. According to the summary of this 2017 research, “The results demonstrated that expanding biofuels and bioproducts production using renewable forest biomass as feedstock contributes to not only alternatives to fossil fuels, but also facilitates forest restoration treatments by providing new markets for management of woody biomass residues.”

Linda Chalker-Scott, Ph.D., a master gardener at Washington State University in Puyallup, Wash., has been a strong advocate for extensive use of wood chips as much in gardens and green spaces. She notes that in a study comparing 15 organic materials, including grass clippings, leaves, composts, yard waste, bark, and wood chips, as mulch for trees and shrubs, wood chips ranked among the best performers in terms of moisture retention, temperature moderation, weed control, and sustainability.

“Unlike the uniform nature of sawdust and bark mulches, wood chips include bark, wood, and often leaves. The chemical and physical diversity of these materials resists the tendency towards compaction seen in sawdust and bark,” she writes. “Additionally, the materials vary in their size and decomposition rate, creating a more diverse environment that is subsequently colonized by a diverse soil biota. A biologically diverse soil biota is more resistant to environmental disturbance and will in turn support a diverse and healthy plant population. Wood chips are considered to be slow decomposers, as their tissues are rich in lignin, suberin, tannins, and other decomposition-resistant, natural compounds. Thus, wood chips supply nutrients slowly to the system; at the same time they absorb significant amounts of water that is slowly released to the soil.” She notes that wood chips have been especially effective in helping establish trees and native plants in urban and disturbed environments.

Wood chips have also been studied in connection with vegetable production to maintain high soil quality. Vegetable production typically involves intensive tillage and cultivation, exposure of bare soil to sun and rain, and erosion from equipment and foot traffic. All of these factors work to destroy organic matter in soil, which over time reduces the productivity of the soil. Two earlier studies, including a 15-year study conducted by the U.S. Department of Agriculture’s Soil Conservation Service and a Canadian study using hardwood chips called “remial,” found that the “ideal” way to use wood chips for vegetable production to improve soil health is to top-dress five to 10 tons of remial chips per year, worked into the soil surface during cultivation.

Wood chips have also been studied as a road-building material. A study from the 1980s in northwestern Wisconsin found that chips “are an effective means of constructing roadway embankments across swamps,” according to the research summary, written by researchers from the U.S. Forest Service. “The cost of materials is about the same as that of soil fills, but the fact that the fill has a much lower unit weight is a significant factor in the reduction of future maintenance costs and environmental damage caused by excessive settlements.”

The study found that “chunk wood,” which comprises pieces that are larger than the chips typically produced by commercial chipping equipment, may have real potential for road-building, and may “provide the national forests with an excellent use for a forest resource for which there are limited or no existing markets.” In fact, use of this product would eliminate a costly disposal problem. In the ultimate scenario, the National Forest could plan future low-volume roads concurrently with future harvesting operations. For example, low-value northern hardwood poletimber stands could be thinned for road building materials. Use of renewable, above-the-ground forest biomass for low-volume roads would ensure the availability of material and would, more importantly, conserve quality borrow-pit materials for higher-standard roads.” A more recent report from Minnesota found that wood chips were a much more preferable lightweight road-building material than expanded polystyrene, shredded tires, and foamed concrete.

Research funded by USDA and conducted by the Conservation Fund examined wood chips as a pollutant-filtering source in denitrification bioreactors for recirculating aquaculture systems (RAS). Without filtration, recirculated water in aquaculture becomes contaminated with ammonia and bacteria, which cause water’s ability to hold oxygen to diminish, thus leading to fish kills. (On a large scale, this is what’s happening in the so-called “dead zones” in the Gulf of Mexico and Chesapeake Bay.) At The Conservation Fund’s Freshwater Institute, research focused on the engineering-based design of enhanced-denitrification bioreactors, or “woodchip bioreactors,” to reduce point and non-point sources of nitrate from agriculture and industry. The results have been promising so far. In a 2017 cost-assessment study, The Conservation Fund researchers concluded “woodchip denitrification bioreactors are a feasible nitrogen mitigation technique for RAS wastewater by establishing system lifetime costs for aquaculture facility operators.” The assessment also found that frequent replacement/replenishment of the wood chips, while increasing costs, also may result in higher nitrogen removal rates over time.

Compared to the volume of wood chips that had been feeding New England’s paper mills and, to a lesser extent, biomass energy plants, all of these novel uses of wood chips – for soil enhancement in gardens, improved vegetable production, road-building, and aquaculture – comprise mere micro-markets, albeit markets filled with promise. Even chipboard manufacturing takes a fraction of the wood chips the paper mills used to consume. What will likely ultimately save the wood chip market is the fact of its cheap abundance. Across American economic history, fortunes have been made when the right use is found for a cheap and plentiful resource. Wood chips right now are exactly that: cheap and plentiful. The market – and loggers – anxiously wait for the right idea to come along.