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Pressure-Treated Wood: Organic and Natural Alternatives

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Synthetically treated lumber is not allowed under the National Organic Program (NOP) Regulations. Arsenic and lead, although natural materials, also are prohibited. Lumber is pressure treated to resist insects and fungi, but the materials used in the treatment are toxic to humans. This publication includes a discussion of currently used materials, lumber treatments using less-toxic materials, decay-resistant lumber species, and an explanation of the National Organic Program Regulation.

Photo: Sachin Ghodke, www.sxc.hu

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Introduction

Lumber treated with prohibited materials is not allowed under the National Organic Program (NOP) Regulations. The NOP prohibits most but not all synthetics. Lumber is pressure treated to resist insects and fungi, but the materials used are toxic to humans. This publication provides information on alternative products, especially for certified organic farming operations, and also includes products that may be of interest to home gardeners but are not approved for organic production. For posts and lumber that are in contact with soil, crops, or livestock, the options include untreated lumber, alternatively treated lumber, alternative plywood products, and untreated fence posts. Producers will need to consult with their organic certifiers to determine whether an alternative product is allowed. For a list of accredited certifying agents, visit http://www.ams.usda.gov/AMSv1.0/nop.

USDA National Organic Program Regulations

Section §205.206(f) of the National Organic Program Regulations declares that "a producer must not use lumber treated with arsenate or other prohibited materials for new installations or replacement purposes in contact with soil or livestock." This restriction addresses a number of applications, including the following:

- Lumber used to build a pasture farrowing hut for hogs, a cattle feed bunk, or a shelter for sheep or calves.
- Lumber for floors, ceilings, or walls of feed or crop storage areas.
- Fence posts in livestock pastures and holding or confining areas.
- Posts, plant stakes, trellising, hoophouse baseboards, and frames of

planting beds used in fruit and vegetable production.

Treated lumber that is isolated from organic production—such as wooden building materials that are not in direct contact with either livestock or crops—*might* not be prohibited but rather *might* be restricted in its applications. The NOP Production and Handling Preamble, Subpart C (7) addresses this issue:

"This provision prohibits the use of lumber treated with arsenate or other prohibited materials for new installations or replacement purposes in contact with an organic production site. We included this modification to clarify that the prohibition applies to lumber used in direct contact with organically produced and handled crops and livestock and does not include uses, such as lumber for fence posts or building materials, that are isolated from production" (USDA, No date).

The National List of Allowed and Prohibited Materials for organic production may be found in Sections §205.601 and §205.602 of the NOP Regulations. It is available online at http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=3f34f4c22f9aa8e6d9864cc2683cea02&tpl=/ecfrbrowse/Title07/7cfr205_main_02.tpl.

Producers should check with their certifiers to see whether treated wood may be used for non-contact areas. Remember, it is important to document any production-isolated uses of treated lumber on the operation's Organic System Plan.

Related ATTRA Publications
www.attra.ncat.org

Organic Materials Compliance

Organic Standards for Crop Production: Highlights of the USDA's National Organic Program Regulations

Paddock Design, Fencing, and Water Systems for Controlled Grazing

What Materials Are Used in Treating Lumber?

Preservatives Applied Before Purchase

Creosote

Creosote—a brownish-black oil made from coal tar, wood, or petroleum—is a restricted-use pesticide that can leach into the soil and pass off as gas into the air during hot weather (Hoffman et al., 2002; Public Health—Seattle & King County, 2000). Creosote- and PCP-treated woods are used mainly for railroad ties and telephone poles. They should never be used in enclosed areas such as greenhouses, because of the gases they can produce (Public Health—Seattle & King County, 2000).

Wood treated with creosote, PCP, CCA, or ACQ is not allowed in organic production.

Chromated Copper Arsenate (CCA)

CCA was commonly used until 2003, when the EPA determined it to be unsafe for residential uses. The CCA mixture, which contains copper, arsenic, and chromium compounds, is dissolved in ammonia and then forced, under high pressure, deep into the wood (Hoffman et al., 2002). According to recent studies, arsenic causes a wide range of adverse health effects, particularly in children, and prolonged exposure to arsenic can result in nerve damage, vomiting, fatigue, diarrhea, nausea, and the decreased production of red blood cells (Green Resource Center, 2004).

CCA-treated wood is perhaps more resistant to leaching than creosote- or PCP-treated wood. However, arsenic, chromium, and copper do leach from CCA-treated wood. Arsenic can collect in the soil under most CCA-treated-wood applications. A 2-inch by 6-inch by 12-foot CCA-treated timber contains an ounce of arsenic; a utility pole can contain 40 pounds of arsenic. Burning the CCA-treated wood volatilizes some of the arsenic, but the ash remaining is technically a hazardous waste. Disposal of CCA-treated wood at landfills may be potentially dangerous because as the wood rots in the landfills, the metals are released and may pose a threat to groundwater (Florida Department of Environmental Protection, no date).

The U.S. Environmental Protection Agency (EPA) has classified CCA as a restricted-use pesticide, and CCA has not been allowed for residential use since December 2003 (EPA, 2008). Additional information on CCA is available online from the EPA at www.epa.gov/oppad001/reregistration/cca.

The following treatments were developed as an alternative to treating wood with CCA.

Alkaline Copper Quaternary (ACQ)

Alkaline Copper Quaternary Ammonium (ACQ) is a wood preservative containing copper and quaternary ammonium compound (quat) as active ingredients. It is used to protect against rot, decay, and termite attack. The composition of ACQ by weight is 67% copper oxide and 33% quat (Lebow, 2004). ACQ does

not contain chromium or arsenic. Quat is a product commonly used in commercial disinfectants and cleaners and acts as a co-biocide. Some copper does leach from ACQ-treated lumber, making it unsafe for garden use.

Acid Copper Chromate (ACC)

Acid copper chromate (ACC) has been used the United States since the 1920s. ACC contains 31.8% copper oxide and 68.2% chromium trioxide, and it has a light greenish-brown color. It is generally used in handrails, guardrails, highway signposts, and glue-laminated beams (Lebow, 2004).

Copper azole

Copper azole (CBA) was a wood preservative with active ingredients of copper, boric acid, and tebuconazole (azole) (Lebow, 2004). A newer formulation known as CA-B is composed of amine copper (96%) and tebuconazole (4%), while CA-C replaces half the tebuconazole with propiconazole (Lebow, 2010).

ACQ, ACC, and CBA are synthetic materials and are not allowed in organic production in accordance with the NOP National List of Allowed and Prohibited Substances.

Preservatives Applied After Purchase

Wood preservatives are treatments designed to sustain the structural and surface integrity of wood by protecting it from rot, decay, and water damage. Treatments listed in this section are less toxic than those used in commercially available pressure-treated lumber, but they might not be allowed for organic production. They might, however, be suitable alternatives for home gardeners. The following wood treatments are not on the National List of Allowed and Prohibited Substances, and are included in this paper as examples of the kind of products that are currently available in the marketplace.

It is important to know that these and products like them were developed to appeal to the "natural" market and not specifically for organic farming. Therefore, although these products contain active ingredients from natural materials, some synthetic materials may still be present in the formulation that prohibit or restrict their use in organic farming systems. These products need to be discussed with organic producers' certifying agencies before any are used; written into the producers' Organic System Plan; and approved by their certifiers. However, if a material contains any synthetic ingredients, it most likely will not be allowed in organic production.

There are two organizations that review products and publish lists of products allowed for organic production. These are the Organic Materials Review Institute (OMRI) and the Organic Food Program of the Washington State Department of Agriculture (WSDA).

OMRI has two lists: the OMRI Products List and the OMRI Generic Materials List. Both include materials for crops, livestock, and processing. The lists maintained by OMRI are available on its website at http://www.omri.org/.

If a material contains any synthetic ingredients, it most likely will not be allowed in organic production.

New products are added to the list and others are removed on an ongoing basis. The OMRI website also has links to the names and addresses of suppliers to make it easier to purchase approved materials.

The Brand Name Material List (BNML) is maintained by the WSDA Organic Food Program and can be accessed on its website at http://agr.wa.gov/FoodAnimal/Organic/MaterialsLists.aspx. There are three versions of the BNML: sorted by product, sorted by company, and sorted by type. Each of these lists can be downloaded as a PDF file. The lists provide the brand names of allowed products and mention any restrictions on their use.

Companies that sell agricultural products often will state in their catalog and on packaging that a product is OMRI- or WSDA-approved. Since the lists change frequently, producers should verify that the product approval is current before they purchase and use it.

When using either the WSDA or the OMRI lists, it is important to check the most recent version and know the complete and correct name of the product.

As always, producers who need to use a product that is not on their Organic System Plan must notify their certifier beforehand.

The best way to determine whether a product contains synthetic materials is to review its Material Safety Data Sheet (MSDS). Most companies

have links to MSDS sheets on their website. If an MSDS sheet is not available, look at the technical specifications for the product in question to see whether any synthetic materials are used. For instance, the product Primer Oil #1 from Bioshield Paint Company (see below) includes lead-free dryers in its formulation that may be made from synthetic ingredients. If detailed information is not available on a company's website, producers may have to call the company and request an MSDS or a label delineating all ingredients.

One manufacturer of commercial exterior-wood preservative is Bioshield Paint Company of Santa Fe, New Mexico. Bioshield manufactures paints, stains, thinners, and waxes that are made from such naturally derived materials as citrus peel oils and solvents, essential oils, seed oils, tree resins, inert mineral fillers, tree and bee waxes, lead-free dryers, and earth pigments. For additional information on these products (including lists of ingredients) and for ordering information, visit the Bioshield website at www.bioshieldpaint.com.

Linseed oil has been used as a wood preservative for centuries.

ES+ Wood is pressure treated with the inorganic synthetic borate compound Disodium Octaborate Tetrahydrate (DOT) as well as a natural preservative and EnviroSafe Plus®, a colorless water-repellant polymer system. This product may be restricted from organic farming applications. More information is available at www.eswoodtreatment.com.

Another commercial exterior-wood-preservative company is Sinan Company of Davis, California. Sinan distributes AURO Natural Paint products, which are manufactured from natural raw materials, including a linseed oil that is organically grown and not diluted with petroleum solvents. Sinan has additional information on these products and ordering information on their website at www.sinanco.com/index.html.

Lifetime Wood Treatment is a wood preservative manufactured by the Canadian company Valhalla Wood Preservatives, Ltd., in Calgary, Alberta. Lifetime Wood Treatment is advertised as an eco-friendly nontoxic wood preservative made up of naturally occurring plant and mineral substances combined in a special recipe that has been handed down through generations of a family of wood craftsmen. Product and ordering information is available on the company's website at www.valhalco.com.

Linseed Oil Wood Preservatives

Linseed oil has been used as a wood preservative for centuries. Raw linseed oil has a slower drying time than boiled linseed oil but does not contain synthetic solvents. Linseed oil treatments may require repeated applications every three or four years. The treated wood can be painted after the linseed oil fully cures.

This treatment recipe comes from Jamestown Distributors, a marine supply company in Rhode Island, and is traditionally used on wooden decks for schooners, fishing boats, and porch decks:

- One quart of turpentine. Turpentine might be allowed if it is derived from a wood source. Organic producers should check with their certifier.
- One quart boiled linseed oil. Certified organic producers should use raw linseed oil. Raw linseed oil has no synthetic solvents.
- One half pint of pine tar. The label should detail whether it contains dryers or other synthetic ingredients.
- One half pint of Japan Drier. This product is synthetic, so it is prohibited in organic production.

Jamestown Distributors' website is www.jamestowndistributors.com.

Certified organic producers who try a similar recipe should be careful only to use accepted materials and to allow for extra time for full curing due to the absence of synthetic dryers in the recipe. Once again, any material that may be used on a certified organic operation should be discussed with the operation's certifier and disclosed on the the Organic System Plan before it is used.

Borates

Borates (boric acids and borax) have long been used for alternative wood protection and can be used with all types of lumber, logs, and plywood. Borax, a naturally occurring mined material, is allowed for organic production. Borates and boric acid are synthetic substances allowed for use as an insecticide in organic production as

what is described in the National List 205.601 as a "structural pest control, [not in] direct contact with organic food or crops." Borate-treated lumber and borate wood treatments are available commercially.

Borate wood treatments will penetrate to the center of the wood when the wood is dipped, especially when the wood is freshly cut or when seasoned wood is rewetted. Because borates are water soluble; however, they will leach from the wood when in contact with water in the soil, leaving the wood unprotected. This is the reason that borate-treated lumber should be used only in locations that are at least six inches above the ground and protected from excessive rain. Borate-treated wood is not considered suitable for unprotected outdoor use, such as for fence posts or poles, but it is suitable for most building-construction purposes. Additional information on borate products and sources is available in the Wood Treatment section of the online information source Sustainable Sources. http://woodtreatment.sustainablesources.com.

Alternatives to Treated Lumber

A limited number of alternative lumber treatments are commercially available. These alternatives are free of arsenic, chromium, and other preservatives classified as hazardous by the EPA. However, they may contain ingredients that are synthetic or have not yet been evaluated by the National Organic Standards Board (NOSB) or approved by the NOP. The use of any of these alternative lumber products needs to be included in a certified organic operation's Organic System Plan and approved by its certifying agency before any application or use.

Considering the many situations in organic operations where wood is in contact with soil, seed, feed, or livestock, organic producers and handlers need to use acceptable materials. A number of alternatives are available, such as untreated wood, stone, brick, steel, materials made from recycled plastics, cement board panels, concrete blocks, and concrete.

Before selecting which alternative products to use, the producer needs to evaluate each situation by a number of criteria:

- Effectiveness of the product for the task and conditions
- Durability of the product and the life expectancy required for the task
- Availability of the product
- Ease of installation
- Cost effectiveness of the product and any maintenance needed
- Safety

The problem with untreated lumber is decay or rot, especially when the wood is placed in contact with the soil. Osage orange, redwood, eastern red cedar (juniper), western red cedar, black locust, and bald cypress are domestic wood species that are naturally more decay resistant than others. However, not only can durability vary among different wood species, it can vary between trees of the same species or even within one tree; this can cause a wide range of life expectancy for even highly durable wood (Hoffman et al., 2002).

Polymer-Coated Borate-Treated Lumber

Woodguard AG is boron-treated wood in a polymer coating; a product that is certified organic. As of this writing, it is the only treated-wood product that is listed with a state organic certifying agency. The Washington State listing is available online at http://agr.wa.gov/FoodAnimal/Organic/docs/bnml_by_product.pdf. At this time the only certified product the company sells is a post that can be used for stakes, trellises, and other support applications. The company's website is www.wood-guard.com.

Recycled Plastic Lumber and Plastic/Wood Composite Lumber

"Lumber" made of recycled plastic or composites of plastic and wood can provide durable, weather-resistant alternatives to wood for some applications. Formed plastic is approved only for use in nonstructural applications because it doesn't have strength comparable to wood. However, plastic lumber can easily substitute for treated wood in nonstructural applications such as fences, sill plates, and raised beds. The plastics are rot- and corrosion-proof and don't crack, splinter, or chip. Even in exposed and sub-grade conditions, plastic lumber has a long life expectancy. It will not leach chemicals into the ground, surface water or soil, as treated wood can. A challenging aspect of

Not only can durability vary among different wood species, it can vary between trees of the same species or even within one tree.

working with plastic lumber is its relatively high likelihood of expanding, which varies for each product and manufacturer and has to be considered during installation. Thermal expansion is the change in dimensions of a material due to temperature changes.

The number of plastic-lumber manufacturers and their variety of products has notably increased recently. Some companies use only High Density Polyethylene (HDPE) plastic, while others use commingled plastic wastes. A few manufacturers even mix plastic with recycled tire rubber. Some plastic lumber will contain wood fiber, which helps strengthen the plastic and reduces expansion.

Plastic lumber is available in many configurations and sizes, including solid- and hollow-core dimensional products and tongue-and-groove designs. The quality and product performance will vary by manufacturer; many manufacturers have independent testing results available.

Plastic lumber is available in many configurations and sizes, including solid- and hollow-core dimensional products and tongue-and-groove designs.

The website of the Plastic Lumber Trade Association (PLTA) offers publications and links to member companies that manufacture and distribute plastic lumber. The PLTA website can be found at www.plasticlumber.org.

A good introduction to the types and uses of recycled-plastic-lumber products can be found at the California Integrated Waste Management Board Recycled Plastic Lumber website at www.ciwmb.ca.gov/Plastic/Recycled/Lumber.

Alternative Fence Posts

The kinds of permanent or movable fences commonly used on farms include wood plank or rail, welded wire panel, barbed wire, woven wire, cable, plastic net, high-tensile, electric, or a combination of any of these. The various fencing materials and styles all can be used with alternative fence posts. The best type of fence to use depends on the size and number of livestock, the purpose of the fence and the durability required, the soil type and terrain, and the types of crops and other vegetation that border the fence. Livestock will strongly test any fence when there is a lush green crop on the other side of it. Fences for handling facilities and confinement situations need to be stronger and taller than pasture, boundary, or temporary fences.

An excellent source of livestock fencing information is the ATTRA publication *Paddock Design, Fencing, and Water Systems for Controlled Grazing*. This publication covers current fencing technology and some of the basics of paddock design. Another excellent source of information on fencing is the Maryland Small Ruminant Page, which can be found online at www.sheepandgoat.com/fencing.html. It has links to many publications on different types of fencing materials and construction techniques as well as a list of many fencing vendors.

One alternative to treated fence posts is to use untreated wood posts, but many species of wood used as fence posts rot rapidly when they are in contact with the ground. The publication *Native Wood Fence Posts* from the Cooperative Extension of the University of Nebraska-Lincoln (Schmidt and Kuhns, 1990) lists the expected lifespan of many untreated wood species used for fence posts along with information on some of the advantages of seasoning posts before they are used. The paper can be downloaded at http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1861&context=extensionhist.

An older publication, *Service Life of Treated and Untreated Fence Posts: 1985 Post Farm Report* (Miller, 1986) from Oregon State University lists more species and various treatments as well as the lifespan of untreated wood. The publication can be downloaded at http://juniper.orst.edu/post-farm.htm.

Three wood species are rated in Schmidt and Kuhns (1990) as having an expected lifespan of more than 20 years, even untreated. They are hedge (Osage orange), black locust, and eastern red cedar (juniper). Depending on location, these species may be available locally at sawmills or lumberyards. Other species not covered in the publication include such trees as honey mesquite and blueberry juniper, which grow in the southern plains of Texas and other southwestern states. Fence posts made from these trees can last decades before being replaced. Locust and cedar grow in many regions of the country, and there may be available sources of native woods that will outlast standard untreated posts.

Besides untreated wood fence posts, other options include plastic, steel T–posts, steel pipe, concrete, fiberglass, or even concrete–filled PVC pipe. These fence posts will vary

in cost, availability, and practicality for each specific fencing need.

Many plastic fence posts are made from recycled plastic containers. They come in various lengths, dimensions, and colors; can be stapled, drilled, or cut like wood; and are self-insulating for electric fencing. Different fencing companies have various types of plastic posts available. For a list of fencing suppliers, see the ATTRA publication *Paddock Design, Fencing, and Water Systems for Controlled Grazing.*

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Sustainable Sources
http://sustainablesources.com

Provides online information about such environmentally responsible building materials as wood treatments, dimensional lumber, and engineered sheet materials, as well as information about sources of the materials. The website provides access to detailed guidelines and resources on many different environmentally friendly building materials that might otherwise be difficult to find.

USDA Forest Service Forest Products Laboratory
One Gifford Pinchot Drive
Madison, WI 53726
608-231-9200
FAX: 608-231-9592
www.fpl.fs.fed.us

Conducts research on diverse aspects of wood use, including wood preservation, wood and fungi identification, and finishing and restoration of wood products. The laboratory has excellent publications on various wood preservatives and treatments.

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