Lake Notes

Pressure-Treated Wood

Wood used in construction, whether for homes, decks, or boat docks, is continually subject to deterioration by water, weather, and a number of living organisms (fungi and insects in particular) that use wood as their main food source. Untreated wood that is exposed to the outdoor elements can deteriorate within three to five years—and sometimes even within one year—depending on its degree of exposure to soil, water, and other environmental conditions.

Wood used in moist or wet environments is particularly susceptible to decay by organisms that thrive in such conditions. Clearly this deterioration presents a problem for wood structures used in waterbodies such as piers, boat docks, and seawalls. This issue of *Lake Notes* examines the uses, potential hazards, and possible alternatives to using pressure-treated wood in these environments.

What is pressure-treated wood?

The term *pressure-treated wood* comes from the process used to force wood preservatives into the wood's cellular structure. Wood preservatives were developed to extend the life of wood by protecting it from degradation by fungi, insects, weather, and water. Pesticides are the most commonly used wood preservative because of their toxicity to the organisms that consume wood.

The wood treatment process

In contrast to most sealants and shellacs that merely coat the outside of wood to protect it, wood preservatives are forced deep into the cellular structure and bonded to the wood. In the treatment process, the wood is placed in a closed cylinder that is then filled with the wood preservative. The pressure in the cylinder is increased to force the preservative into the interior of the wood until the desired amount of preservative has been absorbed. Excess preservative is then removed from the cylinder and stored for re-use.

Several manufacturers of pressure-treated wood products guarantee their treated wood to resist decay and insect attack for 40 years or longer. Generally, the amount of preservative needed to protect wood from degradation depends on the length of time the wood is expected to be in contact with soil and water. In the United States, the amount of chemical is measured in pounds of chemical per cubic foot of wood. The American Wood-Preservers' Association has established different levels of preservative retention, based on the material's intended use, as shown in the following table.

Intended use of material	Recommended preservative retention
Only where contact with soil is expected	0.4 lbs/ft^3
Foundations	0.6 lbs/ft^3
Continuous water contact	2.5 lbs/ft^3

Chemicals used to treat wood

Three pesticides—creosote, pentachlorophenol (penta or PCP), and arsenic-based compounds (arsenicals)—are the most common wood preservatives in use today. Creosote is produced from three sources. Coal-tar creosote, the most widely used wood preservative in the United States, is extracted from coal. It is the primary treatment for structures such as bulkheads, docks, and seawalls. The two less-common forms of creosote come from high-pressure treatment of beech and other woods (beechwood creosote), and from the resin of the creosote bush (creosote bush resin).

Pentachlorophenol, produced by the chlorination of phenol in the laboratory, is an oil-borne preservative used primarily for utility poles. "Oil-borne" refers to the oil that is used to carry the wood preservative into the wood. Arsenicals are water-borne mixtures of compounds containing arsenic and often copper. Copper chromium arsenate (CCA) is the most common arsenical used for preserving wood. It is most frequently used on lumber, plywood, and timbers for fencing, playground equipment, and decking. Other water-borne preservatives include ammoniacal (containing ammonia) copper quat (ACQ) and ammoniacal copper zinc arsenate (ACZA). Wood treated with arsenicals also is used in boat docks and retaining walls.

Concerns regarding the use of pressure-treated wood

Two issues are relevant regarding the use of pressure-treated wood. First, the chemicals used to preserve wood might not always stay bonded to the wood. Though there are considerable differences of opinion regarding the accuracy of this statement, a number of scientific studies have shown that wood preservatives can and do leach from treated wood and have been found in soil, sediment, and water beneath treated wood structures. The potential for movement of these chemicals into the surrounding environment would not present a problem if they were harmless, which indeed they are not.

Second, in order for these chemicals to protect wood from deterioration, they must be toxic to a wide variety of living organisms and be persistent to maintain their effectiveness over time. Unfortunately, the chemicals are not only toxic to those organisms that consume wood, but in certain concentrations have been shown to be toxic to other organisms, including humans, that are exposed to the chemicals.

Human toxicity

The U.S. Environmental Protection Agency (EPA) has issued a number of consumer information sheets recommending precautions for handling pressure-treated wood. The U.S. EPA indicates that when not handled properly, pressure-treated wood may pose a potential hazard to human and animal health. The National Safety Council indicates that for humans, a toxic level of exposure to these chemicals can occur by a number of pathways including absorption through the skin, lungs, and stomach. The effects of exposure to these chemicals fall into two categories: acute (short-term) and chronic (long-term). Possible acute effects of the chemicals include irritation of exposed areas, pain, organ damage, circulatory and nervous

system damage, and possibly death. Potential chronic effects include organ, nerve, reproductive, endocrine, and immune system damage; birth defects; and cancer and genetic mutations.

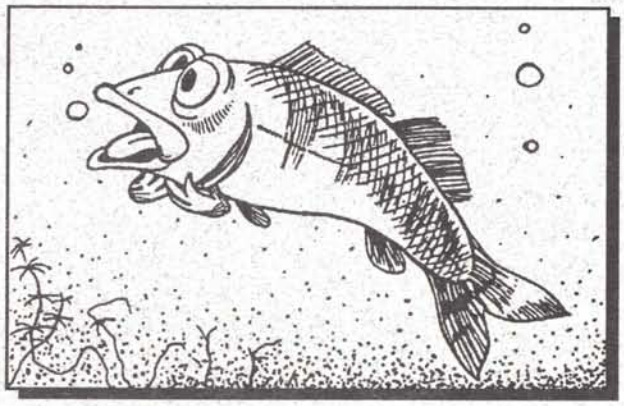
Aquatic toxicity

In addition to potential toxic effect on humans, a number of studies have shown damage to aquatic organisms and environments resulting from the presence of compounds that are associated with pressure-treated wood. While it has not been proven beyond doubt that sufficient amounts of the chemicals leach from docks or seawalls to cause aquatic toxicity, the potential nevertheless exists and the possible effects on aquatic organisms should be considered. Furthermore, these chemicals are thought to *bioaccumulate* (build up in the tissues of individual organisms) and *biomagnify* (increase in concentration in organisms along the food chain.)

Water Flea

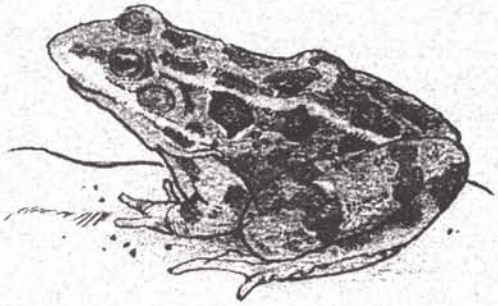
Copepod

Creosote, a complex mixture of toxic chemicals, can have acute and chronic effects on aquatic organisms, accumulate in tissues of exposed organisms, and persist in lake sediments for long periods of time. Some of the compounds found in creosote also can be carcinogenic (cancer-causing). Pentachlorophenol can be acutely toxic to fish and other aquatic organisms, accumulate in animal tissues, and persist in the environment because it isn't readily broken down by natural processes. Arsenic-based preservatives also are acutely toxic to fish and other aquatic organisms and accumulate in their tissues.



Regulating pressure-treated wood

The three major chemicals used to treat wood (creosote, pentachlorophenol, and arsenicals) are classified as pesticides and regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and can only be bought and used by certified individuals. However, pressure-treated wood itself is not classified as a pesticide, and thus is not regulated under FIFRA. The U.S. EPA-Region 5 Pesticides Program Section can provide recommendations regarding the safe use and handling of treated wood. They can be reached at (312) 353-2192.



In Illinois, state statutes do not specifically regulate the use of pressure-treated wood in waterbodies or on land. However, some construction projects within the state's waterbodies (e.g., dock installation, shoreline stabilization), whether or not they involve the use of pressure-treated wood, may require permit approval by the U.S. Army Corps of Engineers, Illinois Environmental Protection Agency, and Illinois Department of Natural Resources.

Disposal of pressure-treated wood

Treated wood waste has not been classified as hazardous waste under the federal Resource Conservation and Recovery Act (RCRA) regulations. Thus, disposal of pressure-treated wood by landfilling is acceptable. However, it should not be burned in open fires, stoves, or fireplaces since toxic chemicals may be produced as part of the smoke and ashes.

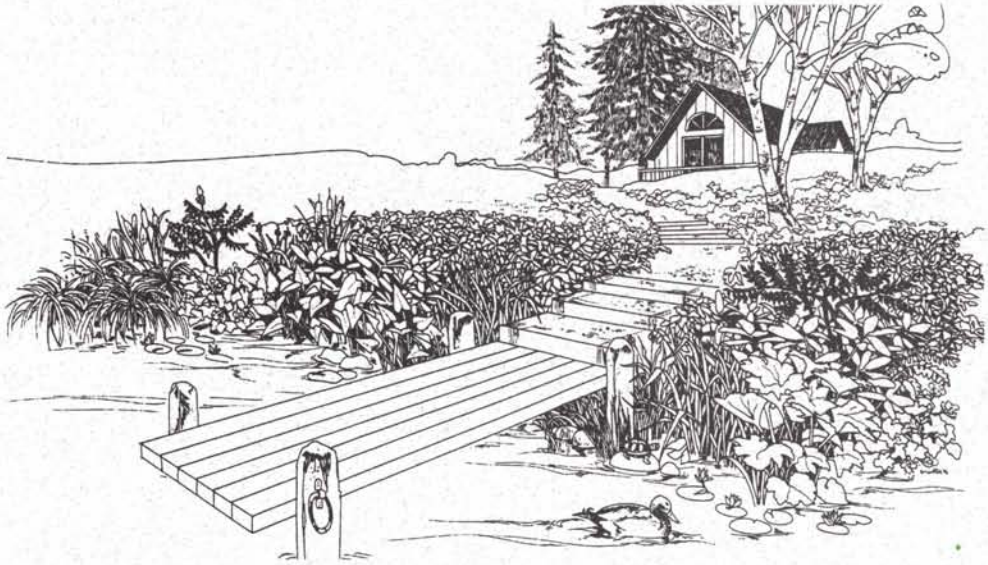
Alternatives to using pressure-treated wood

Since questions remain regarding the toxicity of pressure-treated wood in the environment, it is recommended that alternatives be considered for all uses in which contact with aquatic environments is expected. Alternatives include decay-resistant woods, stainless steel, concrete, fiberglass, and recycled plastics.

A number of domestic woods are considered resistant to decay. While these woods provide a high degree of natural protection due to their chemical composition, some of them are more expensive than wood treated with preservatives, and they may be more difficult to find in the quantity and dimensions desired. Cedar, redwood, and cypress are the most common, but other decay-resistant woods include the following: catalpa, black cherry, chestnut, junipers, black locust, red mulberry, mesquite, oaks (burr, chestnut, gambrel, white, and post), osage orange, sassafras, black walnut, and Pacific yew.

Concrete and stainless steel also can be used in situations in which contact with water is expected. Prices for some concrete and steel products are competitive with wood, even without considering their longer lifespan. Steel presents the additional benefit of being recyclable. Fiberglass is another alternative, although its cost often prohibits its use. Recycled plastic is a relatively new option, and not much information exists regarding its applicability for aquatic environments. Nonetheless, these alternatives yield a lifespan of 80 to 100 years, compared to approximately 40 years for pressure-treated wood. Furthermore, wood must be retreated periodically.

If no alternative is possible, two coats of an appropriate sealer (urethane, epoxy, or shellac) should be applied to the pressure-treated wood every couple of years. Sealant should be applied away from any water resources since these products have adverse environmental effects of their own.



Lake Notes . . . is a series of publications produced by the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. The objective of these publications is to provide lake and watershed residents with a greater understanding of environmental cause-and-effect relationships, and actions we all can take to protect our lakes.

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For more information about other publications in this series and to request copies, please contact: Illinois Environmental Protection Agency, DWPC-Lake and Watershed Unit, P.O. Box 19276, Springfield, Illinois, 62794-9276; 217/782-3362.

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