Part I. Leaching and Environmental Accumulation of Preservative Elements

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Introduction

Because preservative-treated wood is an economical, durable, and aesthetically pleasing building material, it is a natural choice for construction projects in the National Forests, National Parks, and other public and private lands. Wood preservatives such as chromated copper arsenate (CCA) and ammoniacal copper arsenate (ACA) have been shown to extend the useful life of treated wood by 45 years or more (Gutzmer and Crawford 1995). The use of preservative-treated wood also reduces the number of trees that must be cut to replace wood that has decayed in service. The most widely used wood preservative is CCA Type C (CCA–C), a waterborne wood preservative that is inexpensive, leaves a dry, paintable surface, and provides excellent protection against attack by decay fungi and insects. Another effective waterborne preservative, ammoniacal copper zinc arsenate (ACZA), is commonly used on the West Coast and in other areas when specifiers request wood species that are difficult to treat. Wood treated with CCA–C and ACZA is used extensively by the Forest Service and other government and private entities in the construction of structures such as walkways, piers, restraining walls, and bridges. In recent years, other types of wood preservatives such as ammoniacal copper quat (ACQ–B), amine copper quat (ACQ–D), ammoniacal copper citrate (CC), and copper dimethyldithiocarbamate (CDDC) have been standardized for use in similar applications (Table I–1).

Table I–1—Composition of waterborne formulations as specified by AWPA Standards[a]

	Composition (%)					
Preservative	CuO	As_2O_5	CrO_3	ZnO	DDAC[b]	SDDC[c]
CCA–C	18.5	34.0	47.5			
ACZA	50.0	25.0		25.0		
ACQ–B	66.7				33.3	
CDDC	17–29[d]					71–83[d]

[a]AWPA 1997.
[b]Didecyldimethylammonium chloride.
[c]Sodium dimethyldithiocarbamate.
[d]Standard calls for weight ratio between 5:1 and 2.5:1 SDDC:copper in treated wood.

Many applications for preservative-treated wood are situated in pristine and/or sensitive ecosystems where contamination by significant amounts of wood preservative components could negatively affect the environment. Concerns about wood preservative leaching and environmental impacts have risen in recent years, generating pressure to restrict or reduce Forest Service use of treated wood in some types of environments. These environmental concerns have become particularly acute in the Pacific Northwest, and the use of treated wood has not been permitted in several Forest Service boardwalk construction projects. This issue has been difficult to resolve because of lack of data on leaching and biological impacts of wood preservatives, particularly for wood in service (Tippie 1993). Much data on preservative leaching is limited to CCA–C, and tests were conducted on small specimens that tend to accelerate leaching. Results from these studies are conflicting and difficult to relate to leaching under in-service conditions (Lebow 1996).

Perhaps the most pertinent study of leaching from CCA–C treated wood was conducted by the Tasmanian Parks and Wildlife Service (Comfort 1993). In this study, which was conducted to address many of the same concerns faced by the Forest Service in the United States, levels of chromium, copper, and arsenic adjacent to CCA-treated boardwalks were measured at several sites in southern Tasmania. At each site, three soil samples were taken within 150 mm (6 in.) of the boardwalk and three reference samples were removed several meters away from the boardwalk. The boardwalks varied from 1 to 14 years in age; the preservative retention and treating solution formulation were not reported. Levels of copper and chromium adjacent to the track were significantly elevated in comparison to the control samples, but not to extreme levels. Arsenic levels were not found to be significantly elevated above the controls. The highest copper level detected was 49 ppm (controls between 1 and 3 ppm) and the highest chromium level 88 ppm, approximately 60 ppm above the reference sample. No apparent relationship was detected between the age of the boardwalk and preservative component levels; the highest copper levels were detected around a 1-year-old boardwalk and the highest chromium levels around the 14-year-old boardwalk.