



# FinishLine



## Iron Stain on Wood

Iron stain, an unsightly blue-black or gray discoloration, can occur on nearly all woods. Oak, redwood, cypress, and cedar are particularly prone to iron stain because these woods contain large amounts of tannin-like extractives. The discoloration is caused by a chemical reaction between extractives and iron in steel products, such as nails, screws, and other fasteners and appendages. Steel used in contact with wood must not corrode. This can be accomplished by using stainless steel or by coating the steel.

Coatings for fasteners, such as galvanizing (zinc) or ceramic coatings, give a wide range of performance. Shiny galvanized fasteners are electroplated with zinc. The zinc coating is very thin and fails quickly. Dull-gray galvanized fasteners are mechanically coated and can last longer than electroplated fasteners; however, because the zinc coating has significant amounts of iron, staining is likely. Hot-dipped (double-dipped) galvanized fasteners, recognized by their “globby” appearance, give the longest protection to the steel. The globs of zinc on a hot-dipped galvanized screw can clog the head, making the screw difficult to use. Therefore, stainless steel is the best choice for fasteners, particularly screws.

Problems have been associated with traces of iron left on the wood from cutting or slicing; cleaning the surface with steel wool, wire brushes, or iron tools; using finishes stored in rusty containers; and using iron-containing or iron-contaminated finishes. Iron dust from metalworking and even plant fertilizers can be sources of iron. Urine on wood floors will hasten the reaction with iron in wood extractives, producing the discoloration.

A simple test can be used to determine whether wood discoloration is caused by iron. Apply a saturated solution of oxalic acid in water or a saturated solution of sodium hydrogen fluoride (sodium bifluoride) to the stained wood surface.



If the solution removes the stain, then iron is present on the wood. If the solution does not remove the stain, try applying bleach to the stained area. If it removes the stain, the discoloration was probably caused by mildew.

If the iron stain is spotty, try to view the stained wood under a 10x magnifying glass. “Chunky” discoloration is usually a result of molten metal and looks like clinkers from a grinding operation. Stain that resembles slivers or flakes could be from steel wool. An even discoloration throughout the stain indicates that the iron was in solution when it contaminated the wood, probably in a contaminated finish.

It is easy to contaminate wood. For example, a wood processor routinely treated wood with a solution of oxalic acid to prevent iron staining, not realizing that the treatment tank itself contained iron, which contaminated the wood. Merely striking wood with a hammer can cause iron stain on some wood. It is best to cover the head of the hammer when nailing redwood and western redcedar siding.

Oxalic acid reacts with iron tannates to form a colorless complex. After treating wood with oxalic acid, thoroughly wash the surface with fresh, warm water to remove excess acid. If all sources of iron are not removed or protected from corrosion, staining will occur again.

In other words, oxalic acid treatment is only a temporary solution if iron remains on the wood. In time, the oxalic acid/iron complex will break down, permitting the iron to react again with the extractives and form a dark-colored stain.

**Note:** Oxalic acid is usually available from a pharmacy. Always apply a saturated solution; that is, if the chemical completely dissolves, add more in small amounts until the water will not dissolve the additional oxalic acid. For oak, a chemical reaction between oxalic acid and extractives can leave a pink stain if the solution is left on the wood too long.

**Caution:** Use extreme caution when using oxalic acid or sodium bifluoride. Irritation and burns of the skin, eyes, and mucous membranes can occur and ingestion of a few grams can be fatal. Sodium bifluoride (which will dissolve glass) is only available to professionals in retail quantities from Aldrich Chemical (800-558-9160).

R. Sam Williams and Mark Knaebe  
Forest Products Laboratory  
USDA Forest Service  
One Gifford Pinchot Drive  
Madison WI 53705-2398

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