

# Wood, Glues and Tools for Paddle Making

## Riverswest Small Craft Center's Forum on Canoe and Kayak Paddles, Paddling and Paddle Making

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### Wood for Making Paddles

#### *Which wood for paddles?*

Species	Weight lb./cu ft.*	Strength	Abrasion Resistance	Notes
Ash	37.5	High	High	Best wood for rugged paddles. Tools must be sharp. Watch grain direction.
Douglas Fir	31.2	High	Medium	Readily available in clear lengths. Needs sharp tools to avoid tear out. Easy to work with.
Silver Maple	29.3	Medium	Medium	Good compromise between strength and lightness. Best for light use paddles. Easy on tools.
Port Orford Cedar	25.0	High	Medium	Hard to find in clear lengths. Easy on tools and has spicy smell.
Sitka Spruce	22.0	Medium	Low	Clear pieces are scarce and expensive. A compromise with more lightness and less strength. Best for light use paddles.
Western White Pine	21.8	Low	Low	A cheap wood that is easy on tools. Use sharp tools. For light duty use.
Western Red Cedar	19.3	Low	Low	Good choice for touring paddles. Readily available in clear lengths. Easy on tools and easy to work with.

\*At 12% moisture content, from USDA Wood Handbook

#### ***Flexibility***

Absorbs shock  
Easier on joints  
Loss of efficiency

#### ***Weight***

Weight is very important if touring.  
Weight is less important for white water and rugged use.

#### ***Strength***

The use of stronger woods can result in thinner paddles.  
Match the wood strength to the application.

#### ***Abrasion Resistance***

Shallow paddling can damage a softwood paddle very quickly.

#### ***Where to find wood***

Don't spend more than \$20

Home Centers  
 Reclaimed/Recycled/Recovered  
 Premium Wood Suppliers

### **One Piece Paddle**

Does not rely on glue  
 Works best with green wood or air dried wood.  
 Kiln dried lumber can be too dry and have hidden defects.

### **Laminated Paddle**

Requires gluing  
 Can be made from many pieces of lower quality wood  
 Can look very good  
 Can select different woods for different parts of the paddle.

## **Glues for Making Paddles**

Type	Waterproof	Strength	Gap Filling	Cost	Notes
Resorcinol	100% Waterproof	High	No	\$\$\$	The only true marine glue. Ugly red glue line. Needs high clamping pressure and 70 F
Marine Epoxy	Almost waterproof	High	Yes	\$\$\$	Many types and temperature ranges. Avoid contact with skin and can be messy. Fails to bond to highly acidic woods or if over clamped.
3M 5200	Approved for underwater use	High	No	\$\$	Almost impossible to remove. Great where flexibility is needed.
Liquid Polyurethane	Not for continuous underwater use	High in tension, low in shear.	No	\$	Some manufacturers claim waterproof. Can turn your skin black. Needs some clamping pressure. Can be used down to 40 F.
PL Premium Construction Adhesive	Not for continuous underwater use	High	Yes	\$\$	Used as joint filler in stitch and glue boats when encapsulated by epoxy.
Urea Formaldehyde Plastic Resin Glue	Not for continuous underwater use	High, can be brittle	No	\$	Dry powder that you add water. Long open times and cleans up with water. Will not creep like PVA glues but needs 65 F to cure.
Titebond III	Not for continuous underwater use	High	No	\$	Cleans up with water. Can creep years after setup. Can be used down to 55F. Needs some clamping pressure.

# Tools for Making Paddles

## Basic Tools

Pencil, straightedge, tape measure, combination square, clamps, safety glasses, hearing protection.

## Power Tools

Table saw, band saw, planer, jointer. All available at the RiversWest boat shop.

## Specialty Tools

Spoke shaves -- Stanley 12-951 or 12-064

Cabinet scrappers

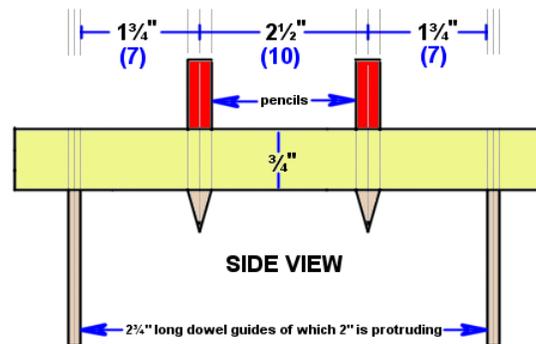
Low angle block plane -- Stanley No. 60-1/2

Smoothing plane -- Stanley No. 4 or No. 5

Drawknife

## Homemade tools

Spar or 8-siding gauge



## Links

### Wood

Crosscut Hardwoods. <http://www.crosscuthardwoods.com> Every type of hardwood, softwood and plywoods

Urban Hardwood Recovery. <http://www.urbanhardwoodrecovery.com> Recovered hardwoods from the Portland area.

Woodcrafters. <http://www.woodcrafters.us/> Wood, tools, and finishes. "Everything for the woodworker"

Building Material Recycling. <http://www.materialforless.com> Search for "503-345-9805" in Portland Craigslist for the latest specials.

The ReBuilding Center. <http://www.rebuildingcenter.org/> Used building and remodeling materials

ReStore. <http://www.pdxrestore.org/> New and reusable building materials

### Glues

Bob Smalser articles <http://www.woodcentral.com/cgi-bin/articles.pl#smalser>

### Tools

Bob Smalser articles <http://www.woodcentral.com/cgi-bin/articles.pl#smalser>

Cian Perez collection of links to interesting articles [http://www.cianperez.com/Wood/Wood\\_home.htm](http://www.cianperez.com/Wood/Wood_home.htm)

The "Scary Sharp" Honing Method <http://primeshop.com/access/woodwork/scarysharp/>

Brent's Sharpening Pages <http://www3.telus.net/BrentBeach/Sharpen/index.html>

## Bob Smalser's General Notes on Glues and Goos

**Resorcinol:** The marine standard. If you can get 70 degrees F or higher for an overnight cure and consistent and high clamping pressure with no gaps, you won't go wrong using it. (Cover with an electric blanket to be sure.) Likes wood at 10-15% EMC, according to Navy tests. Long open time. Repairable with epoxy. Ugly red glue line.

**Marine Epoxy:** The repair and restoration standard. Bonds well to a wide variety of materials, and usable in almost all flexibility and temperature conditions. Needs no clamping pressure, only contact...fills gaps well. Likes wood below 12% EMC. Repairable with itself, joints can sometimes be broken apart for repair with using heat. Clear glue line and can be dyed to match the wood. Controllable open time with different hardeners. Slightly permeable to water vapor and there are reports of failures in fully saturated wood and with White Oak. Very sensitive to UV, requiring protection.....and easy to overclamp when pulling in thick wood or imperfect joints.

**3M 5200:** A rubbery, polyurethane sealant in various colors with adhesive properties sometimes used as a glue. Fails as a glue under water saturation without high clamping pressure, and without the proper strength testing I couldn't do here, it's not recommended as a stand-alone marine glue. Repairable with epoxy.

**Liquid Polyurethane:** Gorilla Glue, Elmer's Probond, Elmer's Ultimate, and others. Versatile in temperature and bonding wet wood with moderate open time, these glues aren't rated for below waterline use but initial use shows potential as a marine glue. Likes high clamping pressure and fits similar to resorcinol...it won't fill gaps. Will successfully glue green wood at 30% EMC, but the wetter the wood, the weaker the bond. Repairable with epoxy. Noticeable, yellow-brown glue lines.

**PL Premium Construction Adhesive:** This polyurethane goo shows promise as a marine glue with further testing and use. Works like 3M 5200 but cures and behaves like liquid poly. Appears to bond well to everything epoxy does, and more where epoxy and liquid poly won't, perhaps because of a higher isocyanate content...it bonds to difficult surfaces only cyanoacrylate super glues will bond to. The only general-use glue I've found that will bond difficult aliphatic-contaminated surfaces. Appears flexible to temperature and moisture content with gap-filling ability, but as a construction adhesive, its open time is shorter than liquid poly. Appeared to like high clamping pressure, and unlike other glues, wouldn't bond at all without at least some. Repairable with itself and epoxy. Glue line as in liquid poly.

**Urea Formaldehyde Plastic Resin Glue:** Weldwood, DAP and others. The old interior furniture standard, and in older marine applications that required well-blended glue lines. Still preferred by many, as it is a no-creep glue easily repaired using epoxy. Long open time, it needs tight fits and 65 degrees F or higher for an overnight cure...it doesn't fill gaps. Best glue line among them all and moderate water resistance still make it useful for interior marine brightwork applications. A relatively brittle glue and UV sensitive, it requires protection...but its brittleness is an aid to repairability, as joints can often be broken apart for repair. An inexpensive powder with a short, one-year shelf life.

**The Titebond Family of Aliphatics:** Convenient. No mixing, just squeeze. Short open times, fast tack, and short clamping times. Fast, and an excellent layup glue...in heated, commercial shops, I've had rough-cut Titebond panel layups in and out of the clamps and thru the planer inside of an hour. Flexible in temperature and to a lesser extent in moisture content, but the bottled glue can freeze in unheated shops, and glueups require 55 degrees or warmer to cure. A flexible glue, it has been reported to creep under load, sometimes several years after the joint was made. The latest "Titebond III" appears to be a stronger glue than its two predecessors. Difficult glues to repair, as they won't stick to themselves and no other glues will except cyanoacrylates, which are too brittle for general use. Epoxy and fabric aren't bonding to aliphatic glue lines in marine strip construction, compounding repair difficulties. While not definitive, the new PL Premium appears to bond well to Titebond III residue and is worth pursuing by those repairing old white and yellow aliphatic joints.