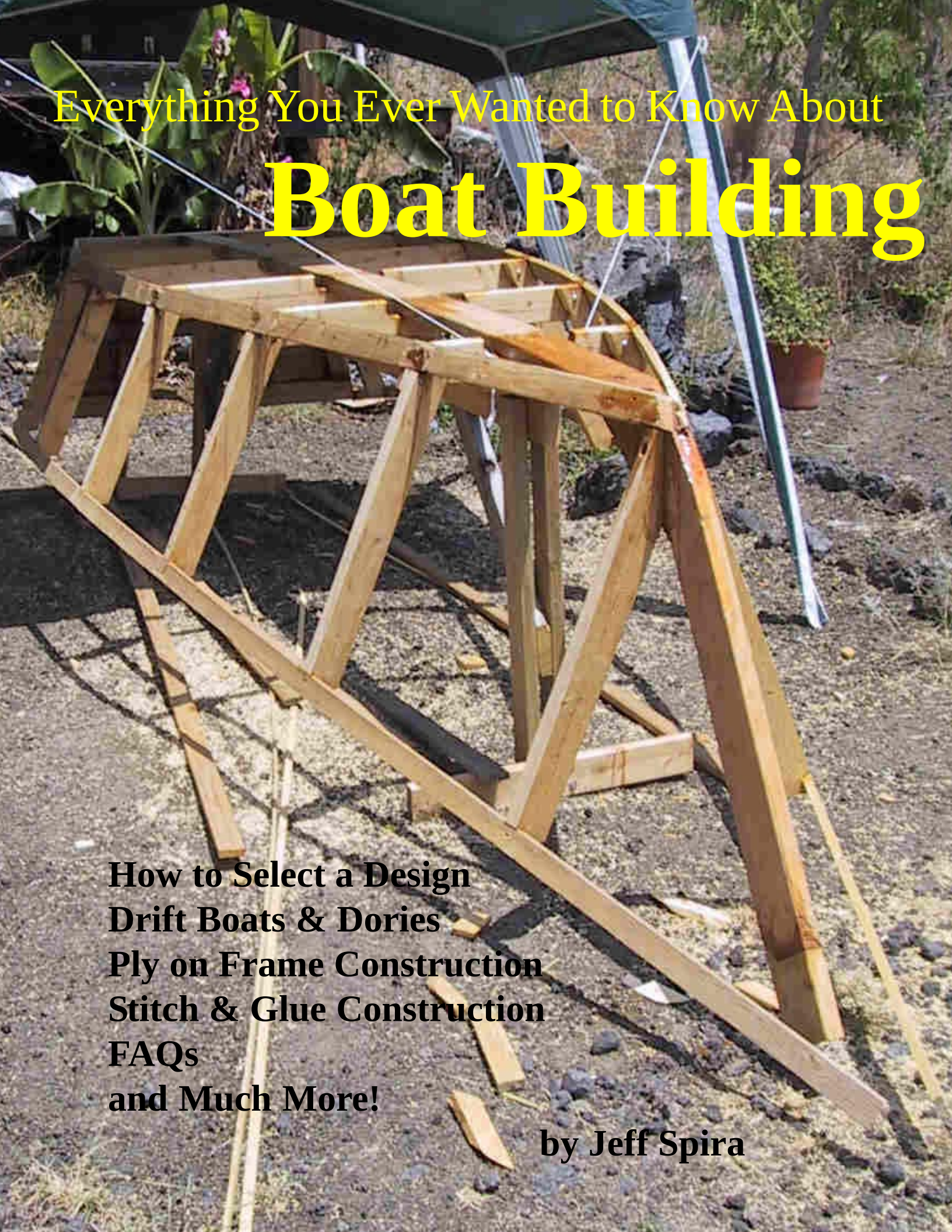

Everything You Ever Wanted to Know About

Boat Building

How to Select a Design
Drift Boats & Dories
Ply on Frame Construction
Stitch & Glue Construction
FAQs
and Much More!

by Jeff Spira

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Selecting a Boat to Build

The Style of Boat For Your Needs

Before you ever start building a boat, you should first consider what type of boat you want and/or need. I say and/ or, because a lot of people think they want a certain type of boat, due to current styles or some fanciful dream, when they actually should be considering an entirely different design. Let's discuss some of the basics of boat hulls so that you'll be able to look at a hull and figure out how it will perform.

Displacement Hulls

All boats operating at low speeds are displacement hulls. This includes planing hulls going slow. What defines a displacement hull is that the boat displaces the weight of water equal to the boat's weight (including the weight of the people and cargo inside.) Sailboats, canoes, kayaks, most dories, rowboats, trawlers, and cargo ships are all examples of displacement hulls. For a displacement hull to move through the water it must push water aside as it passes, then after it passes water comes back together to refill fill the space taken up by the hull. The ease at which the boat passes through the water is dependent upon the shape of the hull at the waterline.

Look at it this way: Imagine a kitchen knife. If you push it through water sideways, there's lots of resistance to it moving, but if you push it through water edge first, it moves quite easily. Displacement hulls work the same way. If their waterline shape is long and skinny, like a knife, they move through the water with ease. However, if the shape is short and wide, they have lots of resistance to motion. The ideal shape for a displacement hull is a canoe or kayak shape: long, narrow, and pointed at both ends. Believe it or not the stern shape is just as important as the bow shape when it comes to minimizing the drag. If you take a look at displacement hulls, like racing sailboats or commercial fishing boats, you'll see that the waterline shape is nearly always double ended, even if the boat has a transom stern.

Note how the waterline of this sailboat is canoe shaped in spite of the transom stern.

As a displacement hull moves through the water, it creates a wave both at the bow, where the water is being shoved aside, and at the stern where the water is rushing back together. These waves get larger as the boat moves faster. As a displacement hull approaches the speed where these two waves interact, the waves actually start to push each other apart. Since the bow wave cannot move forward, as it is being created by the bow of the boat, the stern wave actually separates from the stern and begins to move aft of the stern as the boat increases in speed. The speed where this stern wave separation takes place is called the "hull speed." If the boat goes faster than the hull speed and the stern wave separates from the stern, the hull "squats" or lowers in the stern and begins having to not only move forward, but also move upwards, climbing a continually receeding hill

of water. Trying to push a displacement hull faster than its hull speed becomes very inefficient power wise. If, for example, a 10 hp outboard pushes a certain boat to it's hull speed of 6 knots, putting on a 20 horse motor (doubling the power) may only get it up to 7 knots.

Note how both the bow and the stern create waves as this displacement hull moves through the water.

Planing Hulls

If you want to go fast on the water, you need a planing hull. At low speeds a planing hull works like a displacement hull, pushing water aside in front of it and bringing it back together after it. When the hull hits a certain speed, though, it rises up and skims across the water's surface, in an action known as hydroplaning. The planing hull skims across the water's surface like a flat rock skipped across the surface of a pond. Planing hulls are characterized by very flat lines aft and broad transoms. Ski boats and many of the popular center console fishing boats are classic planing hulls. They may be either flat bottomed or vee bottomed.

Planing hulls are usually very poor performers in the displacement mode. They take a lot of power to move along slowly and often don't track well (go straight.) If you intend to row, sail or low power your boat, trolling, for instance, a planing hull is not a wise choice. The feature that helps a boat plane, a broad transom, is what causes the most drag in a displacement mode, the water having to come together after the hull passes through it creating turbulence and holding the boat back from slipping quietly through the water.

Semi Displacement or Semi Planing Hulls

Many hulls, particularly those designed in the early days of power, when motors were unreliable, are called semi-displacement or semi-planing hulls. These are hulls that are a compromise between the two, since often those early motors would break down and force the boater to row or sail home. Some more modern hulls are designed this way as well, especially in boats like party fishing boats - usually fairly lightly loaded. They need to break out of the "hull speed" restriction to go faster using moderate power, but cannot afford the huge amounts of fuel consumed by the powerful engines that would be needed to get them to plane. Here's an example of a semi displacement hull underway.

Vee Bottom or Flat Bottom

The controversy rages on about which is the better boat. I've had people look at me in disbelief when I suggest they can use a flat bottomed boat, such as a Grand Banks dory, for deep water ocean use. They've always been taught that flat bottomed boats flip over. I don't know where that idea came from, but on several occasions, I've heard, "You'd actually take a flat bottomed boat to Catalina?" (an island about 25 miles off the coast of Southern California.)

The secret of boat stability is more a function of the boat's center of gravity and loading than the shape of the hull. In truth, a flat bottom hull is more stable at rest than a vee or round bottom hull, when it comes to shifting loads from side to side. That's why big ships like freighters and tankers are all flat bottomed. The flat bottom hull tips far less than the vee bottom. This is called "initial stability," and it's why flat bottom hulls are often a better choice for fishermen and people who bring along shifting loads, like children or dogs, who cant seem to sit still.

The one thing left unsaid so far, though, is that once a flat bottom hull passes it's stable range, it does tend to become unstable, for instance, when struck abeam by a breaking sea, more quickly than a vee bottomed hull. In conditions like these, a round bottom or vee bottom hull with a weighted keel has far more tendency to return to upright than a flat bottomed hull.

Flare

Flare is another thing to consider in a design. Flare refers to the outward flaring of the sides of the boat. Note in the two views of boats in the following diagram, the hull of the boat on the right gets wider the higher the sides rise above the waterline. You can see that it has more flare than the boat on the left.

Boat with lots of flare

Boat with little flare

What flare does is provide what is known as reserve buoyancy, which is a fancy term for stability in rough seas. That's why many dories have lots of flare, so rough, choppy seas will bounce them around a lot but rarely swamp them. Boats with a lot of flare also tend to get more stable as you increase their load. If you've ever hear someone say you have to load down a dory to get it to "sit down on its lines" they're talking about a boat with a lot of flare that tends to become more and more stable as it displaces (sinks into the water) more.

Boat Types

There are only a few types of boats really suitable for the amateur builder. If you're an excellent craftsman, and don't mind spending thousands of hours building a boat, of course, there are innumerable different types of vessels you could build given the motivation. However, if you're the average guy who would like to build a boat with a minimum of difficulty and get it into the water without too much ado, you're limited to a few simple types. Here are some of them:

Drift Boats

Everybody loves the thought of a varnished mahogany McKenzie River Drift boat drifting down a salmon river, tossing hand tied flies with their fly rod and having huge steelhead engulf their offering. You've probably got a picture in your head something like this:

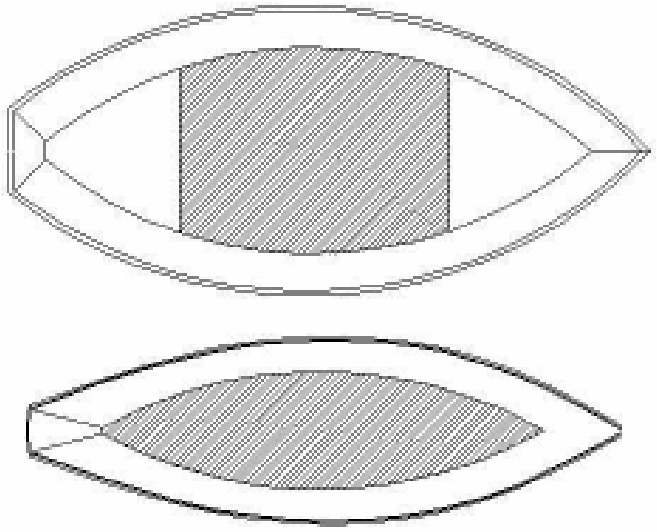
This photo was taken on the real McKenzie River by a builder of the Spira International, Mackinaw Western style drift boat.

Drift boats have developed a kind of cult following. If you fish rivers, especially if you fly fish rivers, you just have to have a drift boat. The truth is that in many rivers you simply don't need the kind of whitewater performance that a driftboat has to offer, and you would be much better served with a boat that rows better than a driftboat. That's a hard concept to get across to some people. It's like the guys who jack up 4 wheel drive pickups, and put on huge off-road tires and shocks. They have a great off road vehicle they use just to commute back and forth to work. Most owners never take their monster trucks off road, and would be far better served by a two wheel drive vehicle with steel belted radials, but hey, the monster truck just looks so cool - and so does the drift boat.

Drift boats are designed for one thing only - drifting downstream. They're not meant to move through the water by rowing, power or any other means. Let me say that again for those who don't believe me: They are NOT designed to move through the water by rowing, power or any other means. True drift boats are rowed only to keep the bow of the boat pointed downstream. They only move at the speed the water is moving. Here's a classic example of the kind of environment a drift boat is perfect for, this Cañonita Dory blasting through the Grand Canyon:

That's what a real McKenzie River drift boat is all about: heading downstream in whitewater. If these are the kind of rivers you fish, well that's the boat for you. I call these "Western Style" driftboats. One caveat, though. If you were to put that driftboat in a calm lake and try to row it across, you'd be amazed at how difficult that would be. I've always said, I'd bet on the captain of my high school chess team - a glasses wearing, frail, 5' 6" wimp, rowing a Grand Banks Dory, against the captain of my high school football team, a 6' 4" bruiser who could bench press 350, rowing a Western style drift boat. Drift boats have almost no glide. Why? beacuse, they are NOT designed to move through the water by rowing, power or any other means.

Here's what the waterline shape of my 17 foot Chinook looks like compared the waterline shape of my 16' Nova Scotian Grand Banks dory. Remember what I said about the most efficient shapes for displacement hulls.

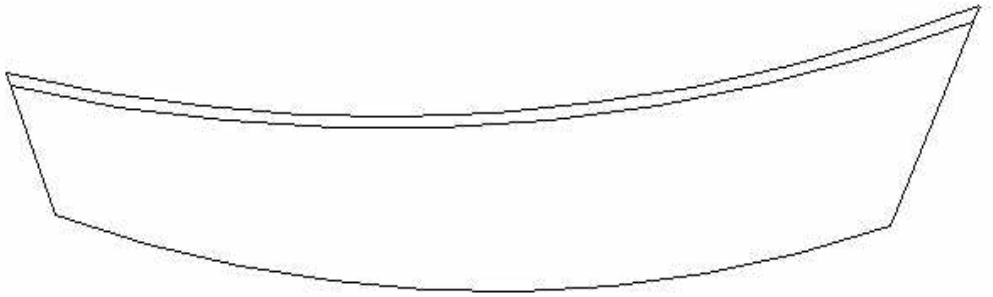


Knowing what you know about displacement hulls and waterline shapes, which of these two boats do you think is more efficient? I know if I were planning a long trip down a big river, let's say the Mississippi from St Louis to New Orleans (being Tom Sawyer was one of my boyhood fantasies) I'll take a Grand Banks dory over a drift boat any old day. Think about this, have you ever wanted to turn

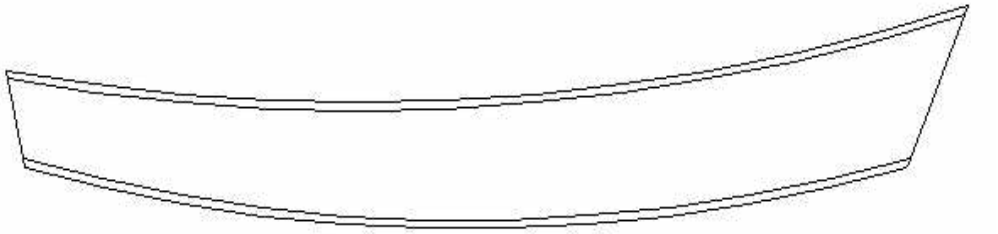
around and go upstream? Even a little ways? Fagheddaboutit if you're rowing a drift boat.

I know what you're saying, "but they look soooooo cool." Ok so to satisfy the "gotta have a cool looking driftboat" crowd, I've developed a different type of driftboat, which I call a "Midwestern Style." With one, maybe my high school football team captain could eke out a victory over the chess team captain if the lake wasn't too wide. These are boats designed for the moderate running rivers common to most of the US, outside the Pacific Northwest. Take a look at these two drift boat profiles, both from my design catalog. The first is a 14' Riverman and the second, a 14' Canadian:

Riverman Western Style



Canadian Midwestern Style



Midwestern Style driftboats are for those of you who occasionally get into some whitewater, but mostly fish downstream in medium speed, wider rivers. If you compare the two styles, the first thing you'll notice is that there's not as much rocker, or curvature of the bottom, in the Canadian (the Mid-Western style) than there is in the Riverman (the Western Style.) If you reduce the rocker, the waterline shape gets longer, so that the boat will row better. It will glide a bit after you apply a power stroke to the oars - not as much, mind you, as the skinny football shape of the Grand Banks style, but it's lots better for rowing than the pure Western style.

The amount of rocker has another effect besides making the hull more effiecient to row. Boats with a lot of rocker pivot extermely well and easily with minimal oar inputs. This is critical when dodging boulders as you're catapulting down a gorge being propelled by angry whitewater, so Western types have plenty of rocker. Speed is of no consequence, since these boats aren't designed to move through the water by oar power.

Put one of these high rocker, Western style driftboats on a calm lake, though, and it becomes nearly impossible to row in a straight line. After all, you are most likely either right or left handed, so even the slight difference in the amount of pulling power of your arms can skid the boat sideways when rowing. If a boat has less rocker and a longer waterline shape, like a knife, it will prefer to go straight rather than turn. This is called tracking. A boat that doesn't track well is very difficult to row, while one that tracks well can be rowed rapidly, in a straight line. So even though the football team captain can put all kinds of energy into his oar strokes, much of it is wasted turning the boat this way and that, while the chess team captain travels in a straight line. Are you willing to bet with me yet? So our exclusive Mid-Western style drift boats offer the river fishermen a whitewater capable boat that also can be rowed in a straight line.

You also notice that the Mid-Western style drift boats have lower sides. This is because of fishing styles. While the Oregon river fishermen needs high sides for all of the splashing and sloshing going on, he also nearly never gets out of the boat when fishing, while the Michigan river fisherman often beaches his boat on the banks, hops out, and fishes the shoreline.

Some Western Style Driftboats you can build:
Plans to build these boats may be found at: http://www.spirainternational.com/hp_wdrift.html




Some Mid-Western Style Driftboats you can build
Plans to build these boats may be found at: http://www.spirainternational.com/hp_mwdrift.html




Grand Banks Dories

The Grand Banks Dory is an old design originally developed to fish the Grand Banks, off the coast of Nova Scotia. The big cod fishing schooners dropped off dozens of dories practically in the middle of the North Atlantic and the fishermen hand lined for bottom fish. The need for a lightweight boat able could cover many miles by oar and/or sail and survive the sudden gales that frequent that area was beautifully filled by the Grand Banks dories. These were originally built by two boatyards in Nova Scotia. Winslow Homer's famous painting "The Fog Warning" masterfully illustrates the life these hearty seafarers led.

Grand Banks dories had a lot of basic requirements. They had to be sturdy, for obvious reasons - Imagine being dropped off in the middle of the North Atlantic in an open row boat to spend the day fishing. Plus the beating they must have taken being stacked up on the deck of a sailing ship necessitated a strong boat. They also had to handle heavy loads of fish, and finally they needed to deal with rough seas safely.

These designs were so successful that they're still used today! Even in today's high-tech, innovative world, Grand Banks dories are considered the optimum rough water pulling boats, Even competitors in surf boat racess use this same, centuries old design. Lifeguards still use Grand Banks style dories for launching through the surf. Grand Banks dories are essentially displacement hulls, and so they work best at low speeds with low power, however, they will perform in the semi-planing mode, and will get up and scoot if decent power is added.

Grand Banks dories are also capable of being sailed. One of the benefits of a hull design like this is that it tracks so well. In many cases you don't even need a centerboard, particularly if you've added a small skeg to the bottom of the hull. The traditional Grand Banks dory sail rig is a spritsail rig, used in the Swampscott dories, the Beachcomber Alpha dories, but even earlier yet, on the original Grand Banks types. If you've ever seen the 1930's version of the movie "Captain's Courageous" you've seen Grand Banks style dories sailed with a sprit sail rig. It looks like this: