

HOW TO CROSS A RIVER

BY BILL MARCH

RIVER AND STREAM CROSSINGS can be the most dangerous part of backpacking. They cause far more backpacking deaths than do snake bites. Yet backpackers are more likely to be aware of snake bite precautions than of the dangers of river crossings.

One of the first problems is recognizing the point at which a stream becomes a river and therefore dangerous to cross. It frequently happens that a hiker crosses a gentle stream on the way in and on the hike back out finds the stream swollen to dangerous proportions. A sudden hot spell can melt snow and cause flood waters in the small stream. A rain storm of an inch or more can similarly swell a stream. In canyon and desert country, a rain storm can occur 100 miles upstream, go unnoticed by you, and cause a flash flood in a mild stream. When a stream becomes a river, it is dangerous.

River crossings should be regarded as emergency procedures to be used only when you have reconnoitered the river and found a suitable ford and when the alternatives to crossing are more hazardous than the crossing itself.

There are many sorts of rivers and streams. They can be broadly summarized in three types:

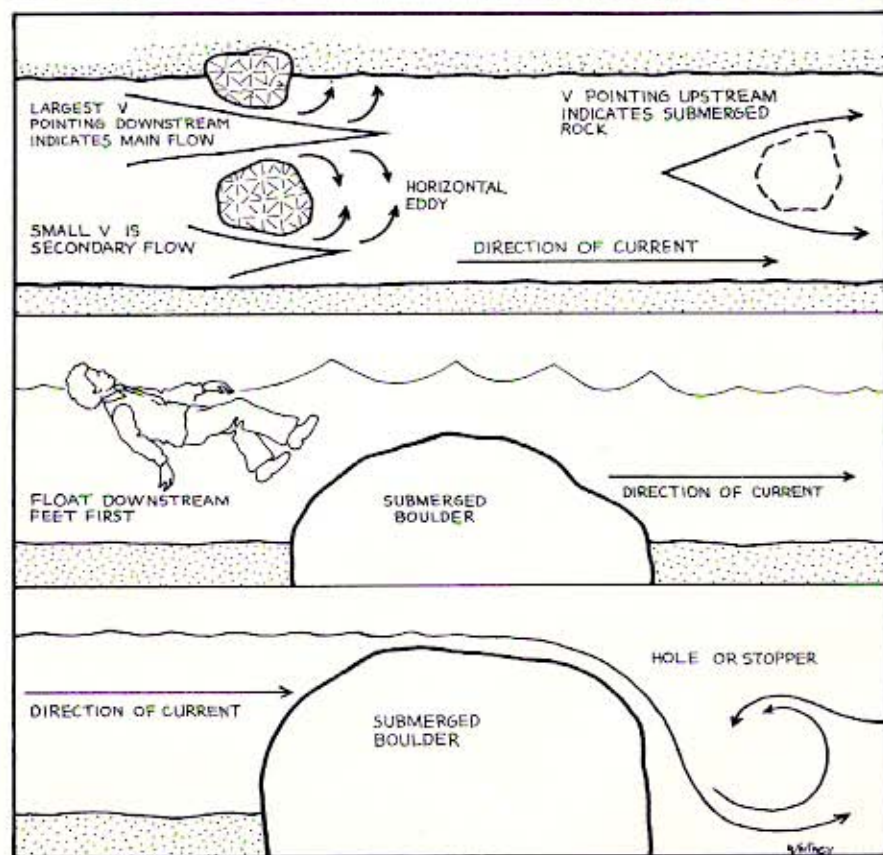
- Rivers with large boulders where the current varies greatly from place to place due to turbulence and obstacles. These are young, immature rivers found high in mountain areas which present serious problems when flooding.
- Rivers where the banks and bottom are coarse gravel and the water does not flow so fast. These are more mature streams and are found lower down in larger valleys or where rivers flow into lakes.
- Rivers where the water is deep and flows slowly. These are mature rivers found in lower valleys where the gradients are gentle.

Each kind of river requires a different approach, but the selection of a satisfactory ford is always of critical importance. A river may be impossible to cross at one place and yet be quite possible to ford a short distance away. In addition, a ford can easily change from safe to dangerous or impossible with a rise in water level.

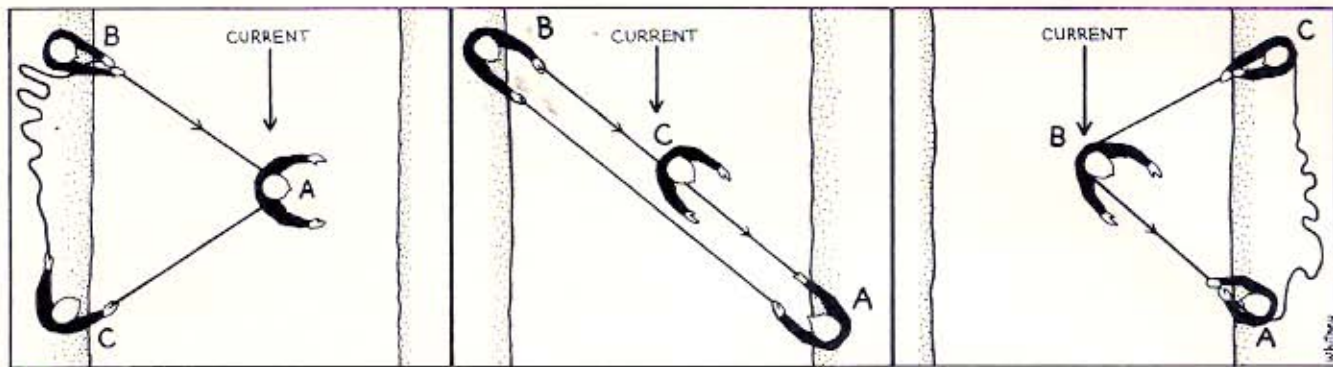
The decision to cross or not to cross depends upon an assessment of the total situation. The color of the water, the nature of the bottom, the width of the river, the speed and volume of the water all are factors to consider. It is inadvisable to attempt to cross a river in which boulders can be heard rolling and trees or logs are being swept along. If no satisfactory ford can be found, it may be better to make a detour upstream and find a route there. If the river is obviously in flood and you have time, it may be best to mark the water level and then wait, especially if the weather is fine and there is little prospect of rain. The level may fall quite rapidly, exposing a suitable ford. In headwater areas with extensive snowpack or glaciers, streams are lowest in the morning after a cold night and highest in the afternoon, with snow and ice melted by the day's heat.

When a river has to be forded, spend some time finding the easiest

and safest place. If possible, examine the river from a high vantage point, where it is easier to ascertain width, speed, turbulence, obstructions and, in clear water, the nature of the bottom. The form, slope, and material of the riverbank may give a clue to the nature of the riverbed. The best crossing is on a firm bed of gravel. Large rocks, smooth slabs, sand, mud, and high banks should be avoided. A ford should be free of obstructions, submerged or otherwise, which can snag your rope, and the outflow below the ford should be reasonable. Care should be taken when crossing silt or sand at the edge of a glacial stream or glacial terminal lake, as it may be quicksand. If the river is clouded with glacial flour (pulverized rock), look out for submerged boulders and rocks. Sometimes it is possible to cross the headwaters of these rocky mountain streams by boulder hopping or by utilizing stable log jams. But great care



Reading Moving Water



Continuous Loop System

should be taken to avoid long jumps with heavy packs as a slip could prove dangerous. Care should also be taken if it is very cold, as the rocks may be glazed with ice. Even under warmer conditions, logs and boulders can be slippery and slimy.

The force of moving water, even if it isn't white-water, is considerable, and its speed should be determined by throwing a small stick into it and noting the rate of movement. Never underestimate the velocity of shallow water. When reading river water and attempting to find a crossing point, a knowledge of water hydraulics and river behavior is extremely useful.

- When a river widens, the water is more likely to be shallow and slow flowing.
- When a mature river increases its gradient, there is often a gravel bar running diagonally across the river above the change in grade.
- When a river's gradient decreases, the river often widens and runs in braided channels which can be easier to cross than the main stream.
- Bends of rivers are poor places to cross. The water is usually deeper and flowing more strongly. The outside bank is often steep and undercut. Water between the bends is likely to be shallower and less powerful.
- When a river is deep but flowing slowly in pools, cross by swimming.
- The main flow is where the biggest V of water points downstream. This is the most powerful section of the current and the most difficult to cross. Ripple formations pointing upstream indicate a submerged obstacle at the apex of the V.
- Obstructions or rock projections above the water level should be avoided since it is possible to be pinned against them by a force of water on the upstream side. On the downstream side of obstructions, there is always an eddy current running upstream. This is often a good place to rest.
- When an obstacle is deeply sub-

merged, the water surface will be broken by large standing waves gradually diminishing in size on the downstream side. The largest wave upstream marks the position of the obstruction. These "haystacks" are indications of fast, deep water and an irregular riverbed. Although spectacular, they are not particularly dangerous.

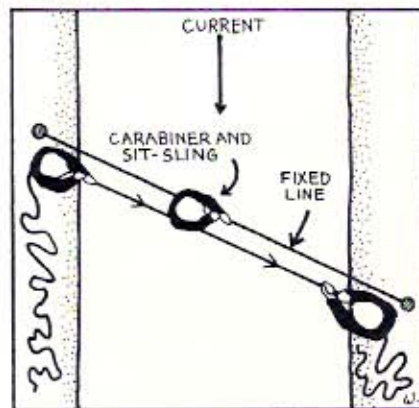
- When an obstacle is large and just below the surface, a small waterfall may form and a strong vertical eddy flow upstream on the downhill side of the obstacle. This is called a stopper, or hole, and is capable of trapping and drowning a person who has been swept into it, especially if the obstruction extends across the entire width of the river. Such holes and falls are to be avoided at all costs because of the great difficulty in escaping from them. To rescue someone trapped in a hole, throw a rope with a bowline loop tied in the end and pull the person out downstream. If no rope is available, the trapped person may take a deep breath and dive to the river bottom, where he should theoretically be swept downstream by the current.

Crossing With a Rope

The best way to cross a river is with a rope as a safeguard. An exception to this rule is when there is a danger of the rope snagging on a rock. If the rope snags, the person crossing may be held underwater and rescue may be impossible. There are several types of roped crossings.

Continuous Loop System. The leader, A, ties on through a loop passed high under his armpits and sets off across the river, supporting himself on the upstream rope held by B. B is not tied into the rope but may be protected by a sling tied to a tree. Downstream a third person, C—also not attached to the rope—passes the rope through his hands as A crosses. In the event A loses his footing and is swept away, B pays out rope and C pulls in A while always

remaining downstream of him. If you try to pull a man onto the bank while upstream, he will be dragged under. When A reaches the far bank, he slips out of the loop and pays the rope through until the loop is passed to C on the other side. C then steps into the loop and crosses diagonally while belayed by B and A. If C slips, B pays out rope and A pulls in from downstream. The last man, B, crosses supported upstream by C and, if he falls, is pulled in by A.



Carabiner and Sit Sling

Fixed Rope, Sling, and Carabiner. An alternative method of crossing, when high banks or trees permit a rope to be stretched across the water, is by using a fixed rope, a sling, and a carabiner. The leader crosses as in the continuous loop system. One rope is rigged across the river as a fixed line, and the next person crossing uses a sit sling and clips into the fixed line with a carabiner. A second rope is used to pull him across. The last man dismantles the fixed line and crosses in the same manner as the first. Separate carabiners and slings are required for everyone except the first and last persons crossing.

Before any method of roped-river crossing is attempted, a clear system of calls and hand signals should be

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U.S. Smelting, Mining & Refining Company in Fairbanks, Alaska. We needed a small river of water for our gold-mining operation. The water was brought part of the way through old pipes sealed at the joints with burlap. Leaks occurred frequently. My job was to walk back and forth along four miles of pipe, checking for leaks. I kept a paperback of Emerson's essays in my back pocket. Out came the essays on Nature, Self Reliance, and Character at every rest break. And they paid me for doing that job!

Talking about solo hiking with

friends has turned up a lot of agreement I did not realize was there. Margaret Scruggs, executive secretary of the Florida Trail Association, calls going alone her "high." David Wells, section leader for the Big Cypress Section of the Florida Trail, was continually organizing and leading trail maintenance hikes. He eventually set out over the same terrain on a day hike by himself and got so carried away with the pleasure of it, he walked 32 miles before dark.

On another level, the experience of going alone is one way back to indi-

viduality in a society in which we eliminate risk, remove uniqueness, and join the herd.

I'm not saying a life of solitude—hermitism—is the best kind of life. Solitude is an alternative form of pleasure. And in the same way remembrance of quiet solitary moments in the outdoors enhances my enjoyment of life within human society, knowledge of our culture gives me a deeper appreciation of nature. Handel and Beethoven quicken my sense to bird song, Newton has helped me wonder at the spider's orb. The psalmist David speaks more eloquently than I can of God's creation.

Sigurd Olson noticed that the Cree Indians in the Athabasca wilderness, living their entire lives in the wilds, did not appreciate their world as much as Olson, whose culture prepared him to appreciate it. We hikers often tend to be romantics, imagining ourselves laden with pack and heading into the sunset. A more realistic and meaningful course is a balance of both worlds, a coming and going from the world of man to the world of nature.

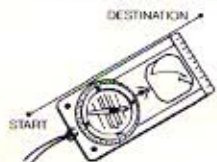
This alternation between wilderness and civilization was seen as the solution for living by John P. Milton, author of *Nameless Valleys*: "A life spent contrasting and living alternately in both worlds . . . seems best to me." Frank Dobie, an essayist on the Southwest, wrote: "The greatest happiness possible to a man . . . is to become civilized, to know the pageant of the past, to love the beautiful, to have just ideas of values and proportions, and then retaining his animal spirits and appetites, to live in a wilderness."

"I am never less alone than when alone," said Hazlitt. With our culture cut off and left behind, we are free to draw deep breaths of clean air, to receive a thousand sensations altogether new since our last visit. To explore the bark of a tree with your fingernail, to feel the velvet undersurface of a mushroom, to wait for the end of a vireo's song, to look at stars in a black night and struggle alone with what infinity means, to be startled by an exploding snipe, to drink runoff from a snowfield with cupped hands, to be frightened by a bear print, to think about those we love from our temporary other-world—these are the kinds of deep pleasures that await us. ▲



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How to Cross a River

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agreed upon. The noise of a river makes conversation difficult between those on opposite banks.

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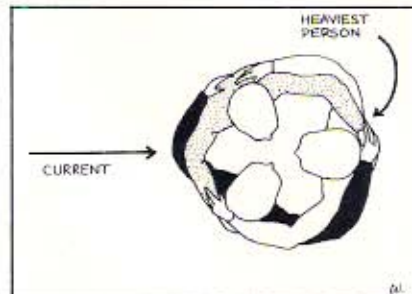


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Crossing Without a Rope

If a rope is not available, then other methods must be used, but with the greatest care. The following methods have been used successfully:

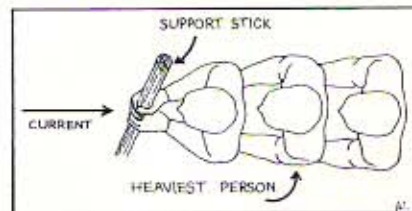
Triangle of Support Method. Three people face inward with arms firmly linked, heads close together, and feet apart. One person, who is also the heaviest, faces upstream, the other two



Triangle of Support

sideways to the current. Only one person moves through the river at a time. In this way the two who are stationary support the one who is moving.

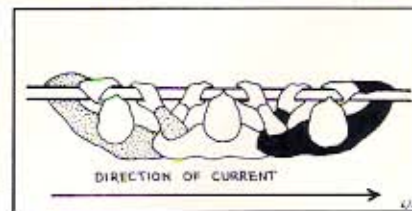
Line Astern Method. Three or more people stand one behind the other, facing into the current, and give each other support by holding onto each other's belts. The front person moves first, then number two, who should also be the heaviest, and finally the third, until the party is in one line again. In very heavy water, each member of the group moves at the same time.



Line Astern

Line Abreast Using a Pole. Three or more persons stand in line abreast, side to the current, with arms interlocked and holding onto a long tree branch. Everyone moves together, giving each other support.

No matter which method of crossing is used, there are certain rules and precautions that should be observed.



Line Abreast Using Pole

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- Keep your boots on. They protect feet from injury and provide a more secure placement, reducing the possibility of a slip or stumble. Socks can be removed and carried in the pack to keep them dry, and wearing gaiters will keep gravel from being worked into your boot tops. On no account should a crossing be attempted without boots, because the feet numb quickly and are easily bruised.

- Baggy trousers offer resistance to water flow and should be removed. If the water is very cold, woolen long johns can provide some protection for the lower body without offering resis-

tance to water flow.

- Your pack should be kept on but with the waist belt undone so it can be removed easily if you lose your footing. The extra weight of the pack increases stability in fast, shallow water. In slow, deep water, the pack will be a source of flotation if saucepans are inverted and clothes and sleeping bags are packed in sealed polyethylene bags. If the pack has a bivouac extension, it should be securely fastened to trap air and increase buoyancy. When you are swimming a slow, deep river, the pack should be floated in front of you for additional buoyancy.

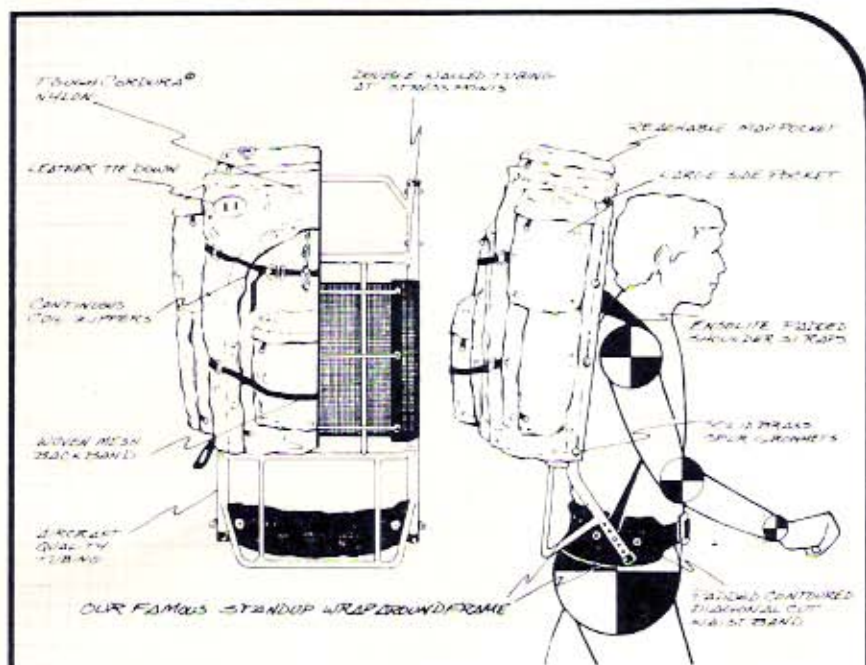
- When crossing, never face downstream. The force of the current will push against the back of your knees and cause your legs to buckle. It is better to stand sideways to the current with hips angled diagonally toward the opposite bank so the current exerts a force in that direction. This "ferry glide" effect assists in conserving energy and makes crossing easier.

- Move one foot only when the other is firmly placed, and shuffle rather than take big steps. Do not cross your legs—keep them apart in a stable, braced position. A stout stick is useful as a third leg and allows two-point contact when moving. That is, move stick, then left leg, right leg, repeat. The stick should be used as a support on the upstream side.

If you lose your footing and are swept away, keep calm, jettison your pack, and float downstream feet first. Keep your feet up to fend off rocks and swim across, not against, the current to try to reach an eddy or slower water. On no account allow yourself to be swept against log jams or fallen trees, as you might be trapped and drowned by the force of the water pushing you under.

A river crossing may chill those involved, especially if it is a glacial-melt stream, and it is advisable to change into dry clothes and have some hot food and drink before proceeding.

Remember that crossing rivers is hazardous and should not be undertaken without fully considering all factors involved and thorough knowledge of the area. It's far better to change your route or retreat than to risk a life in a dangerous crossing. And always give serious consideration to possible river crossings when planning your trip.▲



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