

Water Awareness and Charge Certificate Manual

Module 26: Classifying, Reading and Running the River

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Outcomes

After completing this module, the certificate holder will:

- Be able to describe the international and CSA river grading scales.
- Be able to classify rivers in relation to this scale.
- Be able to list the features found in a river and their impact on paddlers.
- Be able to plan safe passage down a river.

1 RIVER CLASSIFICATION

1.1 Introduction

The intention of the river classification is to provide four steps in proficiency, applicable from a novice to a relatively experienced paddler. Loosely put, there must be four distinct, discernable levels of "graduation" that cover, for example:

A novice learning to paddle on a dam, lagoon, marina, or still water (F)

A novice learning to handle typical South African rivers, with small to moderate rapids, weirs, tree-blocks, sandbanks, eddies and the like (CR rated Rivers). Good examples are the Upper Umgeni and Klip River

A moderately experienced paddler learning to master bigger rivers, with more challenging obstacles, such as higher volumes of water, bigger rapids with significant drops, stoppers, waves and holes, rapids that require significant manoeuvring, bigger weirs and strong currents and eddies (BR rated rivers). A good example is the Dusi and Fish

An experienced paddler ready to tackle technically difficult and potentially dangerous rivers, with demanding high-grade rapids, serious water flow and hydraulic features, rapids with difficult lines that require substantial handling skills and rough water experience to be safely enjoyed. (AR rated rivers) Good examples are Umkomaas, Lowveld Croc.

It is imperative to note that the difficulty grading of any stretch of water can be significantly affected by unusually high or low water levels, as well as factors such as cold, rain, sleet, wind, mist and fog. The presiding charge certificate holder is entitled to revise the river grading appropriately, and apply restrictions to entry, in these circumstances. For this exercise, the ratings are based on "normal" or "average conditions" during the popular racing season.

1.2 International Scale Of River Difficulty

CLASS 0: Flat stationary water - no waves.

CLASS 1: Moving water with a few ripples and small waves - few or no obstructions.

CLASS 2: Easy rapids with waves up to a metre high and wide clear channels that can be seen without scouting. Some manoeuvring is required to avoid obstacles.

CLASS 3: Rapids with high, irregular waves (above 1m) would likely swamp an open canoe. Has narrow channels and some drops causing turbulence which may require complex manoeuvring and even scouting from the bank.

CLASS 4: Long difficult rapids with constricted passages that require precise manoeuvring in very turbulent water. Scouting from the bank is often necessary and the conditions make rescue difficult. Paddlers in kayaks should be able to successfully execute an eskimo roll. There is more than 100 metres to the next pool.

CLASS 5: Extremely difficult, long and very violent rapids with large drops having highly congested routes which nearly always require scouting. Rescue conditions are difficult and there is a significant risk to life in the event of a mishap. Gradient is steep (1 in 20 up to 1 in 10) with large stoppers. Bomb-proof roll is essential!

CLASS 6: The difficulties of class 5 carried to the extreme of navigability, nearly impossible and very dangerous. For teams of experts only, after close study and all precautions taken. Generally a very steep gradient of more than 1 in 5 with a large number of stoppers.

CLASS 7: Also referred to as "Go to Heaven" these obstacles are normally of the man made and must be portaged.

1.3 CSA River Classifications

CLASS F: Flatwater, no discernible flow eg Marina da Gama, Midmar Dam or Victoria Lake.

CLASS CR: Flowing gently, some small rapids (class 1 and 2), and possibly reed channels and/or tree blocks eg Albert Falls weir to Bluegums (Umgeni) or Klip from Henley to Confluence.

CLASS BR: Steady flowing water, with some technical spots that require significant manoeuvring, but seldom exceed class 3 rapids. eg Campbells farm to Dusi Brige (Umsindusi), Breede, Barrage to Parys (Vaal).

CLASS AR: Technical, continuous wild water, with up to class 4 or 5 rapids, usually inaccessible, may containing technically difficult obstacles such as weirs eg Tugela, Umko, Lowveld Croc.

CLASS X: Extreme, for very competent plastic kayak paddlers only eg Thrombosis Gorge, Deepdale to Hella Hella or Ndedema Gorge.

Notes:

A "+" symbol refers to isolated obstacles that exceed the overall grading of the river. These obstacles are identified in the river gradings, and will be highlighted in race brochures, pre-race briefings, race maps, and should ideally be clearly signposted, indicating the portage route, well in advance of the obstacle (example "Fish B+ - Keith's Flyover, Cradock Weir"). Any paddler hoping to trip the stretch of river must make sure that adequate information on the nature and location of these obstacles is sourced, before the trip begins.

"t" refers to a stretch of river where trees growing in the river bed present hazards

"ch" refers to sections where serious channelling occurs, and information on the safest channel must be sourced before the trip or race.

"w" refers to waters that are prone to extremes of weather, particularly cold, rainy or misty weather, where the threat of hypothermia exists.

2 READING THE RIVER

2.1 Introduction

Rocks, trees, concrete blocks and bridge legs are just some of the obstructions that you will encounter in a river. . All these conditions may be found in crossing one part of the river and any obstruction is a danger, but man made obstructions are by far the most dangerous. **The basic rule is when in doubt, get out.** When approaching an obstruction, always get out well before. From a safe vantage point, evaluate the obstruction to determine the correct line to take and if you have the skills to safely paddle that line.

The current flow in a river is very dependent on the water level and rivers change very quickly. An obstruction you can easily paddle at low level may become an enormous wave or hole at higher levels, so don't believe you can paddle an obstruction just because you did it last time.

2.2 Current flow

The water flow (current) in a river will either take the form of a laminar flow, or a white water flow. Laminar flow is smooth and the water surface is unbroken, while white water flow is aerated water found in and around obstacles in the river. Although, to the paddler, it feels that the white water flow is faster, the truth is quite the opposite. Due to the amount of air, white water does not provide as much buoyancy for your kayak or leverage for your paddle as unbroken water.

The current does not flow in a straight line, but swings from side to side. This motion causes bends in the river called meanders. In a bend, the current flows along the outside of the bend, causing undercutting of the banks while a circular current flow (eddy) forms on the inside of the bend. The outside of the bend in the main flow will be relatively deep, while the eddies are typically very shallow due to sediment deposits. In any river the bubbles and floating debris follows the current, which is the fastest line down the river.

The current interacts with objects in the river to form waves, holes and eddies. These river features can be great fun for experienced paddlers, but terrifying for novices.

2.3 Eddies

Eddies are recirculating currents found behind obstacles such as rocks and on the edges of a fast moving body of water or spout entering a pool of slow-moving water. Eddies also are found on the inside of a bend where the mainstream runs outside. On the river side of an eddy, the current flows downstream and it flows upstream on the shore side.

The line where the eddy current flows along side the main current is known as an eddy fence. In general the eddy fence is barely discernable, but in high, big and fast water, eddy fences can become major obstacles and flip boats.

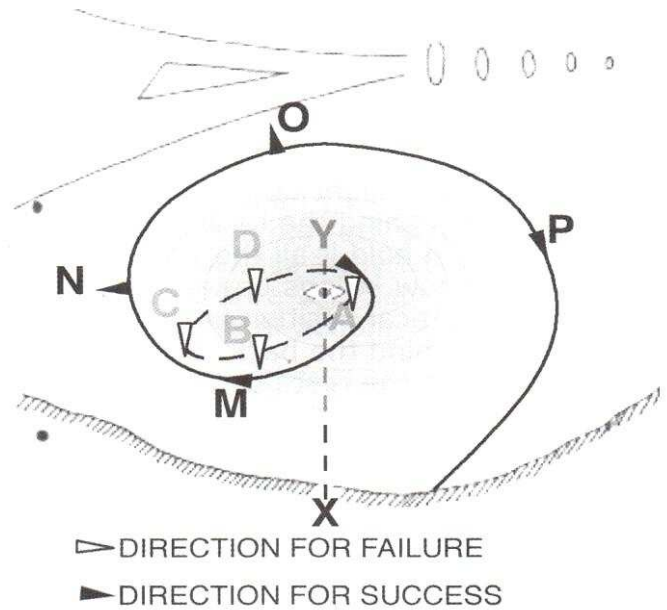
2.4 Whirlpools

Eddies will form whirlpools if the conditions are right. Look out for a whirlpool in a river which is wider than average at some point, where the fast moving water is offset to one side and the backwater is wide and deep. The "eye" of the whirlpool will move around a centre. It is not normally a dangerous phenomenon and whole kayakers are not swallowed up! One may paddle across them with not more than a sudden change of current direction as the eye is crossed. Danger does exist when a swimmer is trapped in one of these "jailhouse eddies". It is more powerful than an average swimmer and it needs a simple drill to break out of it.

Suppose that the pool rotates at a speed of about 3km/h and that the swimmer towing his canoe swims at 2km/h in the direction V-X. He sets out in that direction but is swept upstream by the flow at B. He turns to face the point X and at point C is battling into a 3km/h current which sweeps him around the bend. Because of his angled attack to the water flow he in fact ferry glides back toward the centre of the pool. At 0 he is making progress back toward the eye and feels his progress to be accelerating and therefore satisfactory. At A he is moving toward X with maximum velocity but such is his speed that he spends very little time there, and distance over

the ground toward his objective is minimal. Eventually he continues to trace out an elliptical orbit, the major axis of which is angled toward X and upstream of it. After two or three rotations a sense of helplessness sets in.

The proper way in which to tackle whirlpools as a swimmer is to swim away from the eye of the whirl until free from the pull of the current. At Y one swims in the direction of the black arrow. At M the eye of the pool is directly behind and the aim is upstream of X. At N the direction is directly upstream and the eye of the pool is directly behind the swimmer. At O the swimmer is heading directly away from X and by now well out of the centre of the whirl. At P the pull of the whirl is so slight that he may now start to follow a curving path in towards the point of landing, probably slightly downstream of X.

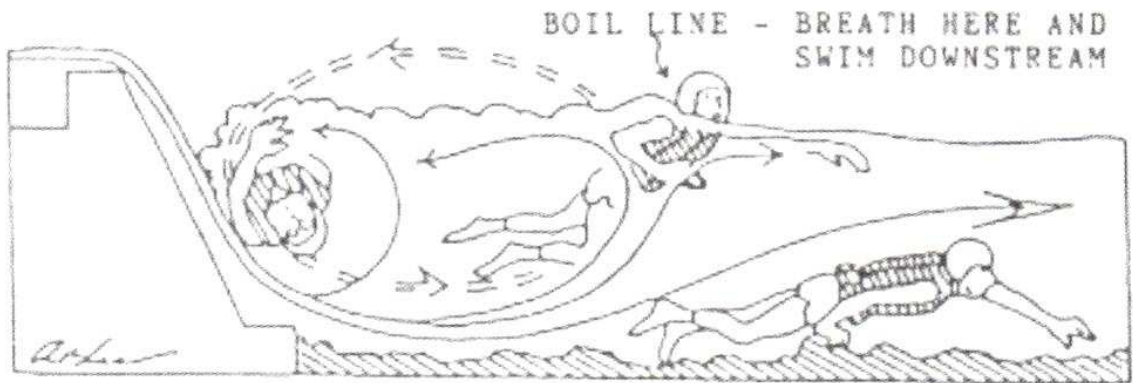


2.5 Hydraulics

Hydraulics, also known as washing machines or slots are incredibly dangerous vertical recirculating currents, found at vertical pour-overs. The force of the vertical sheet of water entering the pool at the bottom causes a suck back. The suck back can be very strong, even overwhelming motorised vessels.

As the water is sucked back, it is pulled downwards with the falling vertical sheet towards the bottom of the river. The flow moves downstream for a distance then rises to the surface at a point known as the boil line. Water upstream of the boil line is pulled back into the hydraulic, while water downstream is free of the suction. The boil line may be anywhere from a few centimetres to several metres downstream of the pour-over, depending on the height of the drop, depth of the river and volume of water

A swimmer stuck in a hydraulic is a perilous situation. The power of the water leaves you almost helpless and disorientated. But there is a way out. When you reach the surface take a breath and another and another and then as you see that you are about to be dumped into the bottom of the slot where the down-flow of the water over the weir meets the stopper, attempt to dive right down as if you were trying to touch the riverbed. Stay down as long as possible and then let your buoyancy aid bring you back to the surface. Get your bearings and check that you are not being sucked back.



2.6 Waves

A wave is similar to what you would find in the sea, but waves in rivers are stationary. A hole is a suck-back caused by rocks or other objects beneath the water, which you will normally find just ahead of a wave.

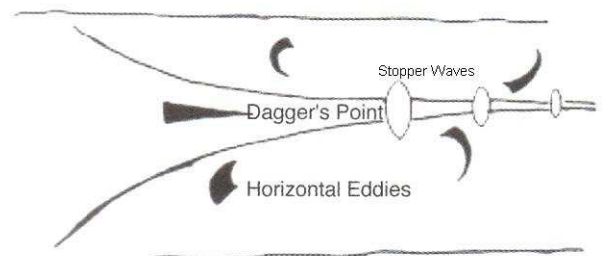
The most startling of the waves is the stopper, which is the first wave one meets when going down the spout. Little ones as on Grade 2 rapids, are not bad but the Grade 4 stopper really stops the boat. The effect is as if one were in a sports car moving rapidly, when the brakes are applied very forcibly. The boat is held firmly and the nose rises and the tail sinks, sometimes resulting in a "tailwalk" or loop. It is essential to keep momentum through the waves, either by continuing to paddle or by reaching forward and planting your blade in the stable current beneath the white water. This current will pull you through and you are also well set to put in a paddle stroke if necessary.

There is a distinct feeling of horror on meeting one's first real stopper because it appears to hover overhead, and then the temptation to stop paddling and hold the paddle high is very strong. Resist, and paddle as if your life depended on it.

Really big stoppers are best avoided by just clipping the edge, but taking care not to move over into the curling eddies which then pull one out to the side. There is usually a narrow band of possible water between the edge of the stopper and the returning water of the contrary eddies.

2.7 Spouts Or Tongues

An evenly running sheet of water moving swiftly is no great problem, but if the speed of the surface varies from place to place because of obstacles, then it becomes difficult to run the section. The simplest form of this problem is where a fast moving spout of water sweeps down into an area of relatively still water. This will occur where shallows give place to deep water. Horizontal eddies are found at either side of the spout and a standing wave in the spout where it strikes the deep water.



2.8 Strainers

Strainers are given their name as they tend to trap large objects, while the water proceeds unhindered, much like a sieve. Strainers most often take the form of a tree block, where the tree stops all large objects on or near the surface, while the main current proceeds underneath the tree. But some types of bridge can also form dangerous strainers.

Always avoid a strainer at all costs, even if it means getting out and walking around. However if you are unable to get out and you enter a strainer by mistake, use the object to pull yourself up and over the object. If you get pulled under the strainer, your chances of survival are not worth betting on. Make sure you are safe before attempting to recover your equipment – boats and paddles can be replaced.

2.9 Natural Rapids

Natural rapids are a result of a change in the form or gradient of the bed of the river and are the most common features you will find on a river. Natural rapids can provide for great fun while paddling, but look out for natural weirs and pour-overs. These occur at ledges and large rocks and the vertical eddy which lies below them can be dangerous.

Natural rapids, especially boulder fields, are high risk areas for foot entrapment. See module 19 for more info on foot entrapment. If you fall out in such a rapid, grab your boat by the handles, keep your legs up and float through to the next pool.

2.10 Man Made Obstacles

Man-made obstructions are among the most dangerous things you will encounter on a river. They obstruct the natural flow of the river and often result in strong hydraulics. Always scout them first to see how big the hydraulic is. The weir presents a level obstacle to the water which sweeps over it in a straight line and down into the slot which is followed by the stopper wave which curls back into the hydraulic.

Another major danger is low level bridges. These bridges are very deceptive as the water appears to be flowing smoothly through. However, the water inevitably speeds up as the water enters the channel and your boat may be sucked down. Unless you can clearly see a path through to the other side of the bridge, it is best to walk around.

At high river levels when the water is flowing over the bridge, the bridge may be hidden from view, but it remains just as dangerous. The suction caused by the water under the bridge can easily drag a kayak down and you will typically find river debris stuck under the bridge, creating a strainer.

3 RUNNING THE RIVER

3.1 Safety Discussion

Before starting off on any river trip, gather all your group together and discuss safety aspects and the trip itself. This discussion must include:

- Gear check – everyone's gear is in working condition and they know how to use it.
- Buddy system
- Paddle signals
- The route itself – everyone must know where the take out is so that no one paddles past.

- In the event of a contingency, what to do

3.2 Scouting

Knowledge of the river ahead is vital. You can start your scouting before you even leave home by checking the flow of the river on the Department of Water Affairs website <http://www.dwa.gov.za/Hydrology/>

The best way to learn a river is to trip with an experienced paddler who knows the river. If this is not possible, be sure to stop and evaluate each obstacle from a safe vantage point, preferably on the bank. As soon as you see / hear an obstacle ahead, move to the bank. Get out sooner rather than later.

As you survey the obstacle, look out for the path of the main current, eddies, pour-overs, holes and big waves. It may not be necessary to run the main current – look out for alternative routes, known as “chickie runs”

When surveying an obstacle, ask yourself the following questions

- a) Is there a line that can be run?
- b) Do I have the ability to run that line?
- c) What are the consequences if I miss the line?
- d) Am I willing to accept those consequences?
- e) Also always work out a plan B – what happens if I miss my line.

If the answer to a), b) or d) is “No”, put your pride in your pocket and walk around the obstacle. You will live to challenge the obstacle another day

3.3 Eddy Hopping

This is the practice of moving from one eddy to another whilst progressing downstream. It is often used in whitewater where running straight down the river may be dangerous. This allows the leader of a group to move from one safe point to another and check what's coming up ahead downstream. It also allows groups to maintain Line of Sight down a rapid by moving one at a time from eddy to eddy, following one another down.

Eddies make great places to stop and rest; rescue, photograph or simply wait for following boats; reconnoitre downstream; recover from mishaps; etc., and, sometimes by skimming the lower end, to slow down, drop unwanted momentum and gain time. The higher one goes on the difficulty scale, the more important this river feature becomes: Using eddies is helpful on Class III, crucial on Class IV, and absolutely vital and essential on Class V. In fact, if you're not using eddies on Class V, everything comes at you way too fast, propelling you into constant trouble.

When powering across eddy lines, during the brief time when the boat straddles two currents there is a tendency to spin and lose one's angle. You can counter this and better hold your angle by applying power only on the upstream side – while crossing the line – when entering eddies, and applying power only on the downstream side – while actually crossing the eddy line – when leaving. Once the boat has fully crossed the line and is no longer straddling two currents, apply power normally. Generally, the best way to cross powerful fences is to hit them squarely (with the long axis of your boat perpendicular to the fence) with plenty of momentum.

Generally, the most efficient way to leave most eddies is to move at right angles to the eddy current, taking the shortest, most direct route to the eddy line and downstream current beyond. Exceptions to this often occur in big, high and swift

water, where the extreme difference between the eddy and downstream currents can create violent fences which can be very difficult to cross. The best way to escape such an eddy is often, starting at the eddy's tail, to power up the length of the eddy and burst across the eddy line at the very top of the eddy.

Learn to spot eddies from well upriver. Even when the eddy itself is obscured from view, it is often possible to see eddies based on the presence of eddy causing obstructions such as bends, outjettings of river bank and big boulders rising up out of the river. It is very important that you have sighted and committed to the next eddy before leaving your current eddy.

3.4 Portaging

When you come across an obstruction that you cannot paddle through, you will have to pick up your kayak and walk around. This is called portaging.

The main reason for portaging are

- An obstruction over the full width of the river that you cannot paddle past, such as tree blocks.
- A rapid / weir which you do not have the skill to paddle through.
- A shortcut to avoid a large bend in the river

Be sure to move to the bank well before the obstruction. Get your group eddy out of the current at least 2 eddies before the obstruction. This will ensure that anyone who misses the eddy or falls out crossing the eddy fence still has a refuge before the obstruction. Then pick up your kayak and place it on your shoulder with the cockpit facing out. Grip the upper edge of the cockpit and carry downstream to a safe put-in

3.5 Ferry Glide

The ferry glide allows you to paddle your kayak across the current without moving up or down stream.

To do this, angle your kayak across the current. The larger the angle the faster you will cross the current. Then paddle on the downstream side of the kayak (back paddle if facing downstream and normal strokes if facing upstream). The force of the current will be counteracted by the force of your paddle strokes and the kayak will move sideways

3.6 Paddling Rapids and Weirs

Rapids and weirs can be great fun if paddled correctly. The first and most important rule of paddling rapids and weirs is always keep control over your kayak. Use your paddle to ensure your kayak goes where you want it and not where the current wants.

Never commit to running the entire rapid, especially if it is large. Always look for a place to eddy-out and take every opportunity to stop and re-assess your situation and the river ahead. Perfect your ferry-glide on calm water so that you will be able to move across the river to keep your lines

Always carry sufficient speed into the rapid and paddle / brace the entire way down. Do not hold the paddle aloft or let go of the paddle and grab the bottom of the boat. If you strike a solid object in the rapid, use it to support you. Lean on the object with the cockpit facing downstream, while you use your hands and paddle to free yourself. With the cockpit facing downstream, the water will flow over or under the kayak. If the cockpit faces upstream, the water will flow into the kayak and it will "wrap" around the object

In the event that you do not manage to paddle through a hole and are held sideways in the slot, as in a weir, all is not lost. Immediately raise the upstream edge of the boat by leaning downstream and by means of a high brace support stroke hold the paddle blade just over the foamy curling return wave. One can hold this position with minor adjustments for any length of time. However the buffeting and noise is disorientating so now you should make your move. By taking small strokes on the downstream side you should inch your way across forwards or backwards to the edge of the slot where the curling stopper wave is not as powerful and you may fight your way out downstream. In order to learn how to handle a hole or weir slot, learn the high brace and hanging draw stroke and then find a tiny little natural weir with a slot not deeper than 10 cm and practice running the length of the slot.

3.7 Swimming Rapids and Weirs

Sooner or later, you will fall out and this is most likely to happen while shooting a rapid or weir. You will not be able to swim against the current and any attempt to stand up could land you in serious difficulty. When this happens, exit the kayak as described previously and attempt to right the kayak. Retain a grip on your paddle and grab the handle of the kayak. The kayak will pivot around you to face downstream. Lie on your back and lift your feet to the surface or wrap your legs around the kayak. The kayak will follow the natural current through the rapid.



Once in calmer waters, swim your boat to the bank so you can empty and climb back in.

If you have lost grip on your boat, relax and lie back in the water. Keep your feet up to prevent foot entrapment and let the current carry you through the rapid. Your PFD will keep you afloat and your helmet will protect your head and neck. Do not worry about what is ahead and concentrate on staying in a horizontal floating position. As soon as you panic, your legs will sink and you could end up in great difficulties.