Is your boat wake or prop wash causing erosion problems?

This leaflet explains how and why it happens – and what you can do to minimise the damage.

Wake up? SLOW DOWN!

What’s the problem?

The soft banks and beds of many Tasmanian waterways are vulnerable to damage from boat wake and prop wash. Easily-affected landforms include estuaries, inlets, lakes and lagoons – places where natural wave energy tends to be low. Banks of peat or mud, shallow lagoons or lakes with muddy beds and sandy deposits in upper estuaries are all areas of risk.

Wake striking the banks can cause rapid and severe erosion, exposing the roots of vegetation and causing the banks to collapse. Wake impact and prop wash can also churn up the sediments, degrading the aquatic environment for plants and animals.

Tasmania

DEPARTMENT *of* PRIMARY INDUSTRIES, WATER *and* ENVIRONMENT

Where does it happen?

In areas where recreational boating activities occur, it is important that boat operators are aware of the potential impact of their wake. Key locations of concern include the Arthur River; some inland lakes such as Penstock and Little Pine Lagoons; and confined waterways at the head of Port Davey and Bathurst Harbour, including Melaleuca Inlet.

In some popular boating and cruising areas, the effects of wake damage have been severe. For example, on the lower Gordon, long stretches of river bank have been washed away, with mature huon pines and myrtles toppling into the river. Tourist cruise vessels were the original cause of the problem – they are now stringently wake tested and travel at strictly regulated speed to minimise wave effects. This has greatly reduced the rate of erosion. But smaller, private craft can easily cause more damage than the regulated cruise boats. Private vessels under eight metres in length are regulated only by a MAST by-law that prohibits speed in excess of 5 knots within 60 metres of shore. However this distance is not enough to protect the now degraded and sensitive banks of vulnerable areas like the lower Gordon.

Please respect the environmental values of the special places you visit. Many sensitive areas aren't signposted so take the time to read on and understand more about the potential impacts of your boating activities.

Photo © Ben Hill

There's a pattern to what you leave behind

Every craft moving over the water leaves a wake. A boat wake has two distinct sets of waves – one following the vessel and the other spreading outwards from its track. The mixture of these two sets of waves forms the wake pattern, which varies with vessel length, speed and water depth. Vessel size and hullform have little influence on the wave pattern but do influence wave height.

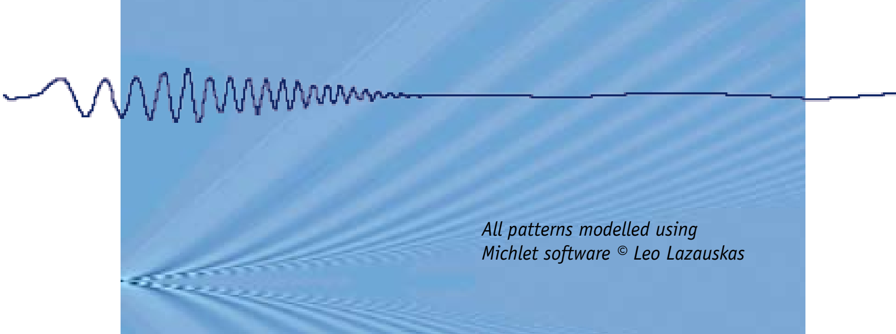
Only waves that are larger than those a shoreline is normally exposed to will cause erosion. But large does not necessarily mean high, at least not in deep water. Because it travels faster, a long low wave can carry much more energy than a short high one.

There are four or five basic wave patterns that a typical Tasmanian powerboat can generate, some of them are dominated by long period waves that can cause a lot of damage where shores are well sheltered from any swell.

Understanding when your boat produces these different wave patterns is the key to controlling its impact.

THE SHALLOW WATER WAVE PATTERN

As a vessel moves into shallow water the wake waves start to feel bottom and slow down. This changes the wave pattern again. Even if the boat is running at displacement speed (but this needs very shallow water) the following waves can't keep up because of drag against the bed, so all the waves spread outwards from the vessel track. The leading wave has a characteristically straight crest and all waves are much straighter than for the planing wake pattern. All waves are feeling bottom and potentially stirring up the bed.



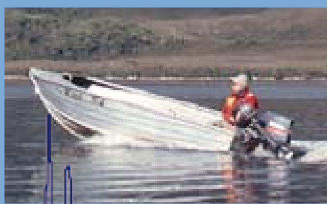
All patterns modelled using Michlet software © Leo Lazauskas

What it all means

THE DISPLACEMENT WAKE PATTERN

Displacement hulls generate bigger wake as their speed increases. They are efficient up to a point (sometimes known as hullspeed) beyond whicch an increasing proportion of additional propulsive power is spent making waves for little increase in speed. Generally speaking, the longer the displacement hull the faster the cruising speed. Below hullspeed most of the energy lost to wavemaking is spent on short waves that follow the track of the vessel.

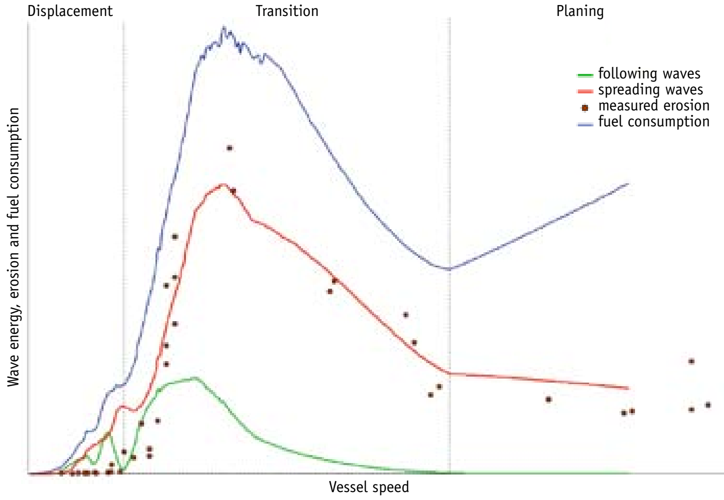
THE TRANSITIONAL WAKE PATTERN



The high power-to-size ratio of high speed and planing vessels means they can power through the hullspeed barrier into transition mode. Here the stern "digs in" as it falls into the trough of the bow wave. The largest possible waves are generated, as fuel consumption skyrockets. As speed increases the wave pattern changes because the waves following the boat start having trouble keeping pace and begin to die away, with waves spreading out from the vessel track becoming dominant.

THE PLANING WAKE PATTERN

When a boat rises onto the plane there is less hull in the water to make waves. The total energy of the wake is less than in transition mode but still greater than in displacement mode. By now the following waves have all but disappeared, so in a confined waterway all the wave energy is heading towards the banks. If you have a close look at the planing wake pattern you'll see that the waves curve outwards and become longer away from the vessel track. Long waves don't just carry more energy – their motion also reaches deeper into the water column and can stir up a muddy bed 5 or even 10 m below the surface. This can mean problems in surprisingly large water bodies – up to the size of Bathurst Harbour – where even the strongest winds only create a relatively short chop.



Erosion of a typical lower Gordon River bank shows a strong correlation with wave energy and (theoretical) fuel economy. The speed at which erosion starts will vary from vessel to vessel and place to place.

The short beamy hulls and submerged transoms of power boats and dinghies are the perfect recipe for relatively large waves at transition speeds, which start around 4 or 5 knots. At planing speed long waves spread outwards from the vessel track and can cause erosion of bed or banks.

When you're travelling close to banks, slow displacement speed causes the least damage. Before taking the boat onto the plane, get into deep water well away from the nearest bank and get the boat on the plane without delay.

In many of Tasmania's beautiful waterways it's even better if you stay in displacement mode and take the time to enjoy the scenery or troll a line. You'll also be able to travel further thanks to better fuel economy (if you run a 2-stroke motor remember to open the throttle occasionally to keep the plugs clean).

Avoid travelling at transition speed, with the stern dug in and the bow high – you're making the most damaging wake in this phase. Coming off the plane, the same rule applies – pass through the transition phase smoothly and safely, getting the boat level in displacement speed without delay. (Remember that a sudden decrease in speed can cause your own wake to swamp the boat as it catches up.)

What about prop wash?

When you open the throttle in shallow water, the underwater wash from the propeller jet stirs up silt and mud, clouding the water. When the sediments settle again they can smother aquatic plants and degrade habitat. Disturbance and muddying of the water also spooks feeding fish.

The jet formation created by prop slip is greatest during acceleration. The only way to reduce the effects of prop wash is to open the throttle very slowly until the boat is in deep water.

Check your wash – in simple terms, if it's white it's right – if it's brown, slow down, because a muddy tint means you're disturbing the bottom sediments.

Treefall due to erosion of lower Gordon River banks © Grant Dixon

TRUE OR FALSE? SOME FACTS MANY PEOPLE GET WRONG.

1 Boat wake can't cause any more damage than wind-driven waves. YES IT CAN.

Wind driven waves tend to travel along the length of the waterway and directly approach the shore only at bends in the channel. But boat wake may travel almost directly towards the bank and can cause erosion along the entire length of the waterway.

2 Most 'tinnies' are small and light enough not to cause any wake problems. NO THEY'RE NOT.

Speed is just as important as size, and both factors must be considered together. For their size, most outboard powered boats can travel much faster than almost anything else on the water.

3 On the plane, the smaller wake causes less damage. NO IT DOESN'T.

Even though a wake reduces in height as the boat planes, the waves are moving faster, further and travelling outwards from the vessel track. When a planing vessel travels parallel to a sheltered shore, the wave energy is directed towards that shore.

4 You can see what your wake's doing from the boat. NO, YOU CAN'T.

Even if you're fairly close to the bank (say 50 metres away) the peak wake impact of a boat travelling at 20 knots only occurs as the first 5–10 waves hit. By that time, you're half a minute and 300 metres away. The only way to really observe the impact of wake is to stand on a soft shore and watch the impact of wake in all three phases of boat speed. Every boat driver should do this sometime – you may be surprised at what you see.

What can you do about it?

- Be aware of different banks and beds – use your experience to recognise vulnerable landforms
- Keep your speed down – observe speed limits, voluntary and compulsory
- When you're well clear of the banks, move promptly from the displacement mode to planing speed – don't linger in the transitional phase, when the wake is largest
- Only use recognised landing places
- Observe the banks carefully when you're on the water – keep an eye on any changes and report problem areas to Department of Primary Industry, Water and Environment or the local Parks and Wildlife Service base
- When planning a trip to one of the more remote waterbodies check with the local PWS regarding any access conditions that might apply
- Have a quiet word with boat drivers doing the wrong thing – better still, slip them a copy of this brochure
- For more information, visit the website – http://www.dpiwe.tas.gov.au/geodiversity

Front cover © Richard Bennett

We're interested to hear your views on the issues of bank and bed erosion caused by boat wake and prop wash. If you've observed damage or have a comment to make, we'd like to hear from you. Please contact Resource Management and Conservation, 6233 5058 or wavewake@dpiwe.tas.gov.au

ISBN 0724663665

Tasmania
DEPARTMENT of PRIMARY INDUSTRIES, WATER and ENVIRONMENT

Tasmania
MARINE and SAFETY TASMANIA

Inland Fisheries Service

AMC AUSTRALIAN MARITIME COLLEGE

Hydro Tasmania
the renewable energy business