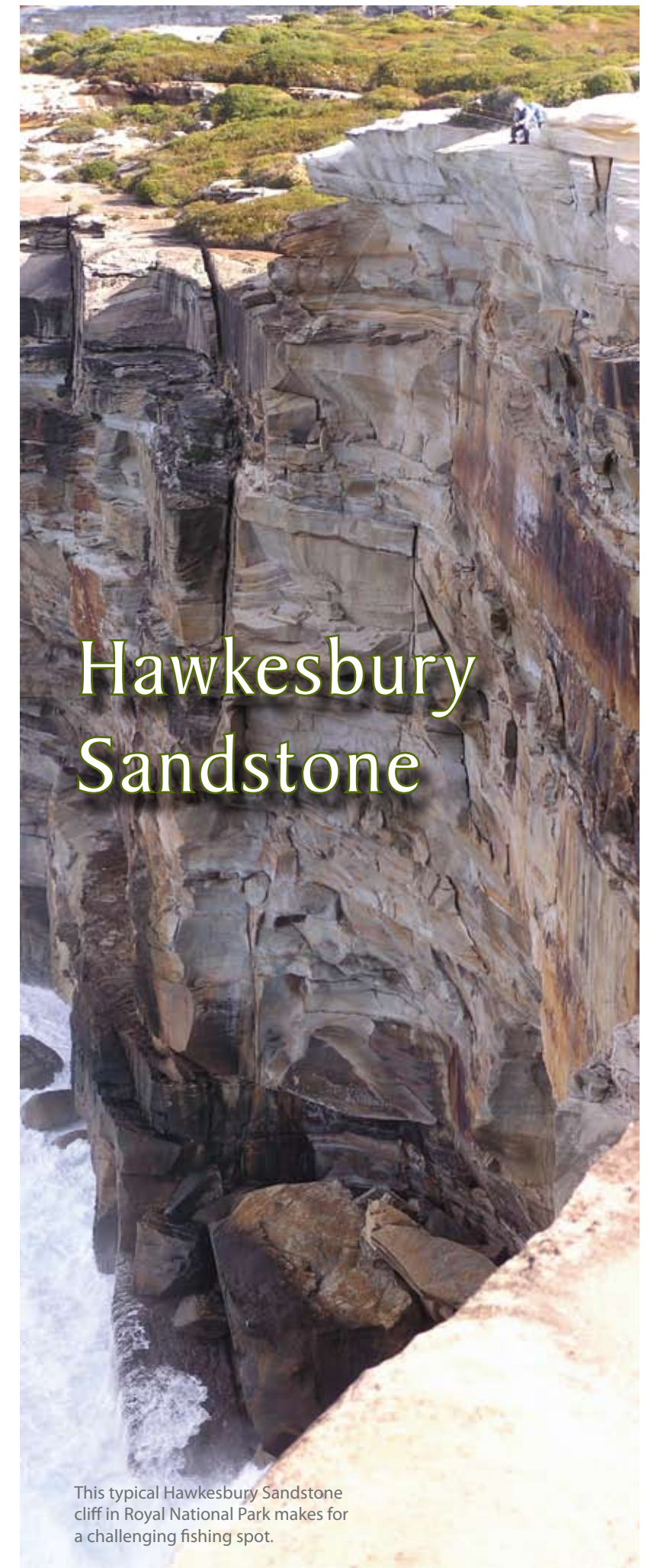


Hawkesbury Sandstone is known to just about everyone who lives in and around Sydney as its foundation stone and the rock from which most of its older city buildings were built. It is hard enough and thick enough to dominate the landscape around the northern city rim and coastline, and even where it thins out along the Illawarra Escarpment and to the north and west, it has gained in altitude and forms the crests of numerous spurs and escarpments, where, undercut by softer rocks, it also hosts spectacular waterfalls.

As one journeys west and north-west one never seems to leave sandstone country. In the lower Hawkesbury valley, the Hawkesbury Sandstone overlies the sandstone-dominant Terrigal and Newport Formations of the Narrabeen Group and a published geology map is often helpful to pick the gradational or interfingering boundary between them. Outliers of a westward and northward thinning Hawkesbury Sandstone are further scattered across the Greater Blue Mountains.

The broad plateaus, rocky spurs and deep valleys and gorges of Hawkesbury Sandstone country have created habitats supporting enormously rich and diverse vegetation communities despite the usual thinness and low fertility of its soils. The heathland plants of Royal National Park grow in the bleakest most windswept sandstone sites but each year in early spring they put on a world class floral display. Contrast these heathlands with the tall Blackbutt and Coachwood forests of the deep valleys and gorges of the Hornsby Plateau and it's easy to see why the Sydney region carries a greater variety of native plant species than does the whole of Great Britain.



Hawkesbury Sandstone

This typical Hawkesbury Sandstone cliff in Royal National Park makes for a challenging fishing spot.



Rocky Hawkesbury Sandstone valleys, like this one at Jerusalem Bay, provide almost limitless sites for plants ranging from tall forest trees and colourful flowering shrubs (Fraser's Boronia) to bryophytes, lichens, ferns and orchids.

Geology and landscapes

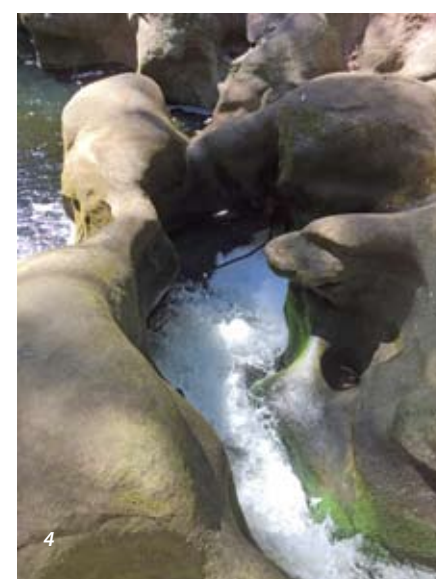
The Hawkesbury Sandstone is undoubtedly the local rock best known to Sydneysiders, defining the landscape of the lower harbour foreshores and rising in altitude to give the northern and south-eastern suburbs their special character of houses on plateaus and spurs above steep-sided, bush-filled valleys. The sandstone is also the honey-brown stone of older city and harbourside buildings, which gives those structures a link with their landscape that is often lacking in Australian cities.

In stratigraphic name terms, the Hawkesbury Sandstone is a stand-alone rock unit and not part of any group like the Narrabeen, though in the Hawkesbury Valley its base intergrades and interfingers with the sandstones of the Newport and Terrigal Formations at the top of the latter, a transition marked by a break in slope (pp 64, 103). It is Middle Triassic in age, about 235 Ma, and up to 280 m thick, though 200 m is the greatest thickness you are likely see in any one landscape setting, such as the deep winding gorge of the Colo River at Upper Colo.

More than 90% of the Hawkesbury Sandstone is medium to coarse grained sandstone, sometimes with small vein-quartz pebbles or granules. Quartz is the dominant mineral of the sand grains, with subordinate ones of claystone²⁸ cemented by a variable combination of clays, the iron carbonate mineral siderite, iron oxides both primary and secondary, plus secondary silica. In outcrop these cements have commonly been leached out or redistributed by deeply-penetrating groundwaters.

The sandstone takes two broadly defined forms: massive and sheeted.²⁸ Massive sandstones have a higher content of lithic grains and occur in thick units often with irregular, erosional bases. They tend to form bluffs or buttresses with case-hardened crusts undercut by caves and honeycomb weathering. The sheeted form is strongly layered and features multiple sets of cross bedding. Its sea cliffs are often bristling with ledges (1 above).

These sandstones are widely regarded as the flood plain deposits of a huge, braided river system with some intermittent estuarine influence, the Brahmaputra flood plain of India and Bangladesh being a popular model.²⁸



There remains a third rock type: lenses of mudstone, shale, siltstone and laminite that make up a small part of the sandstone's thickness. Shale lenses are more common towards its top, mostly less than 5 m thick though a large lens at Duffys Forest in Sydney's north was recorded up to 35 m.²⁸ Where such uppermost shales cap ridge crests, as they commonly do, they can be hard to distinguish from outliers of Mittagong Formation and Ashfield Shale, and published mapping and interpretation has moved them up and down stratigraphically over the decades.

Studying the hydrology of the Hawkesbury Sandstone, John Lee²⁹ distinguished A, B and C subdivisions in which the middle B unit is more flaggy and with shaley intervals. The bench-like profile and flaggy sandstone and siltstone intervals in the lower half of the sandstone on Bowen Mountain's slopes (p 135) may belong in part to this subdivision.

The shale lenses and their floras are covered in more detail from p 131. ▶

HAWKESBURY SANDSTONE
a distribution map

adapted from the 1:500,000 scale
Sydney Basin Special Geological Map Sheet³

0 10 20 kilometres 50

Hawkesbury Sandstone



Some classic features of Hawkesbury Sandstone and its weathering

1: The cliffline at Cape Solander near Kurnell is largely made up of sheeted sandstone layers that display strong cross bedding and weather into multiple ledges. Massive sandstone, lacking obvious cross bedding, forms the lowest third of the cliff.

2: This outcrop shows disruption of cross bedding by quicksand-like soft sediment slumping due to instability in the deposits of a vast river braid plain with innumerable soggy, shifting sandbanks. Slump folds can often be found in the same sandstone bed over many hectares. The eye of the famous Whale Rock in North Epping is one such structure.

3: The sandstone of this rock platform at Manly is riddled with joints that are scoured by wave wash, leading to a grid pattern of slots and crevices.

4: Karst-type solution processes play a small but significant role in stream erosion of Hawkesbury Sandstone. Here at the "washtubs" on Waitara Creek, a stream bypasses a small waterfall via a solution swallet in its sill. Many sandstone streams disappear into potholes, swallets and subsurface channels, or bubble and trickle beneath jumbles of fallen sandstone blocks, many bigger than cars.

The Hawkesbury Sandstone creates the bush-clad plateau rim of the Sydney Basin on its northern and southern sides and laps up onto the sandstone tablelands of the lower Blue Mountains. But it is at its most scenically striking where it looms over Lake Burrarorang (pp 16–17) and where it forms the crest of the Illawarra Escarpment (opposite). It dominates the scenery of the north side of the Sydney area too, especially in the vicinity of the Hornsby Plateau and Hawkesbury valley. Generally it rests on the Narrabeen Group but south-westwards it erosionally oversteps both it and the Illawarra Coal Measures to come to rest directly on Shoalhaven Group strata just west of Bundanoon. Aerially, it makes up more than 90% of Ku-ring-gai Chase and Royal National Parks, creating rolling expanses of heathland and woodland cut by steep-sided valleys and gorges or terminated abruptly by sea cliffs.

Because the Hawkesbury Sandstone forms rugged terrain and rises to hundreds of metres above sea level quite close to the coast, it attracts a good rainfall that partially compensates for the low fertility of its soils. Its open, windswept clifftops, rocky gullies, waterfalls, deep shady valleys and gorges and undulating wooded and heathy tablelands and spurs host a stunning diversity of plant communities and species. ▶

Some classic Hawkesbury Sandstone landscapes

1: Hawkesbury Sandstone can host spectacular waterfalls especially where its elevation exposes softer underlying rocks. This view of Fitzroy Falls reveals Yarrunga Creek dropping 80 m over the sandstone to a rockfall that conceals a much-thinned sequence of Illawarra Coal Measures, plus Narrabeen Group represented mainly by Bald Hill Claystone. It then cascades over sandstones of the Broughton Formation (aka Budgong Sandstone) of the Shoalhaven Group.

2: The Illawarra Escarpment breaks up southwards into promontories and outliers. Drawing Room Rocks, at the southern tip of Barren Grounds Nature Reserve, features Gardens of Stone style sculptures atop sheer sandstone cliffs. These, and flat-topped peaks like distant Broughton Head, represent the southern limits of Hawkesbury Sandstone.

3: One of Australia's great river valleys: the sweeping incised meanders of the tidal Hawkesbury have cut down through Hawkesbury Sandstone into the sandstones of the Terrigal Formation, a flattening in slope marking the transition. The Hawkesbury Sandstone capped summit levels of distant interlocking spurs, at around 250 m asl, reflect remnants of the old land surface of the original Hornsby Plateau.



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