2 THE MANAGEMENT AREA

2.1 Location and Environmental Characteristics

Wallis Lake is a large sub-tropical estuary situated on the New South Wales mid north coast covering an area of approximately 85 km^2 (Figure 2.1). The catchment is spread across the three local government areas of Great Lakes Council (65%), Greater Taree City Council (30%) and Gloucester Shire Council (5%).

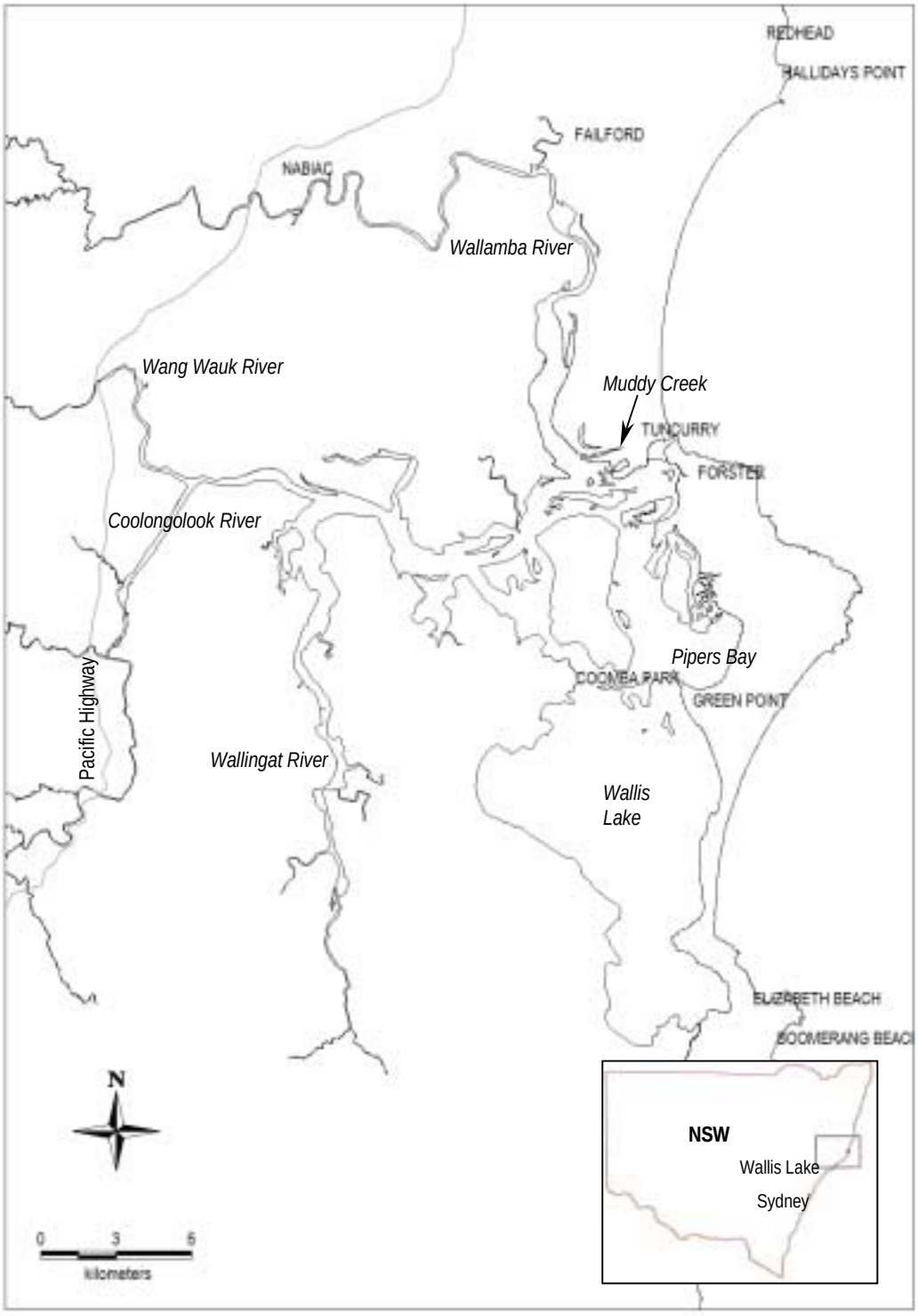
The four main river systems that discharge into the Lake are the Wallamba, Wang Wauk, Coolongolook and Wallingat Rivers. Of these river systems the Wallamba has the largest sub-catchment of 437 km^2, approximately one third of the entire Wallis Lake catchment (1440 km^2). The Wallamba is also the most modified with 69% of the sub-catchment cleared for agriculture. The Wang Wauk (207 km^2) and Coolongolook (172 km^2) are the next two largest sub-catchments. These sub-catchments have also been modified for agriculture with the Wang Wauk considerably more cleared than the Coolongolook (57% compared to 28% respectively). The Wallingat sub-catchment (182km^2) has experienced the least amount of clearing (18%) and is largely national park and state forest.

As a consequence of these land use patterns, nearly 60% (17 123 $kg.yr^{-1}$ P and 108 091 $kg.yr^{-1}$ N) of the total nutrient load entering the Lake can be attributed to the Wallamba and Wang Wauk sub-catchments based on Catchment Management Support System computer modelling (Great Lakes Catchment Management Steering Committee 2001). This is in spite of these sub-catchments comprising only 45% of the land area of the entire catchment. These nutrient loads have been identified as being unsustainable (Harris 2001).

The area experiences a mostly summer rainfall regime with an annual average rainfall of 1215 mm and an annual median of 1206 mm for the period 1896 to 1997 (Webb, McKeown and Associates 1999). High magnitude flooding can occur during summer, however the flood variability, and hence variability in river discharge, is considerable. This also influences the rate of nutrient and sediment input to the estuary system.

The entrance to the Lake system is kept permanently open by two training walls resulting in considerable tidal exchange between the ocean and the estuary and maintaining the clear blue waters for which the twin towns of Forster/Tuncurry have become famous. Waters of the entrance/island area of the Lake will completely exchange with the ocean on a time scale of 1 day to 1 week, increasing to greater than 2 months in the southern parts of the Lake and the middle to upper reaches of the rivers (Great Lakes Catchment Management Steering Committee 2001).

Information on the cultural history, natural significance, major industries and productivity of the Wallis Lake estuary can be found in Appendix 5.

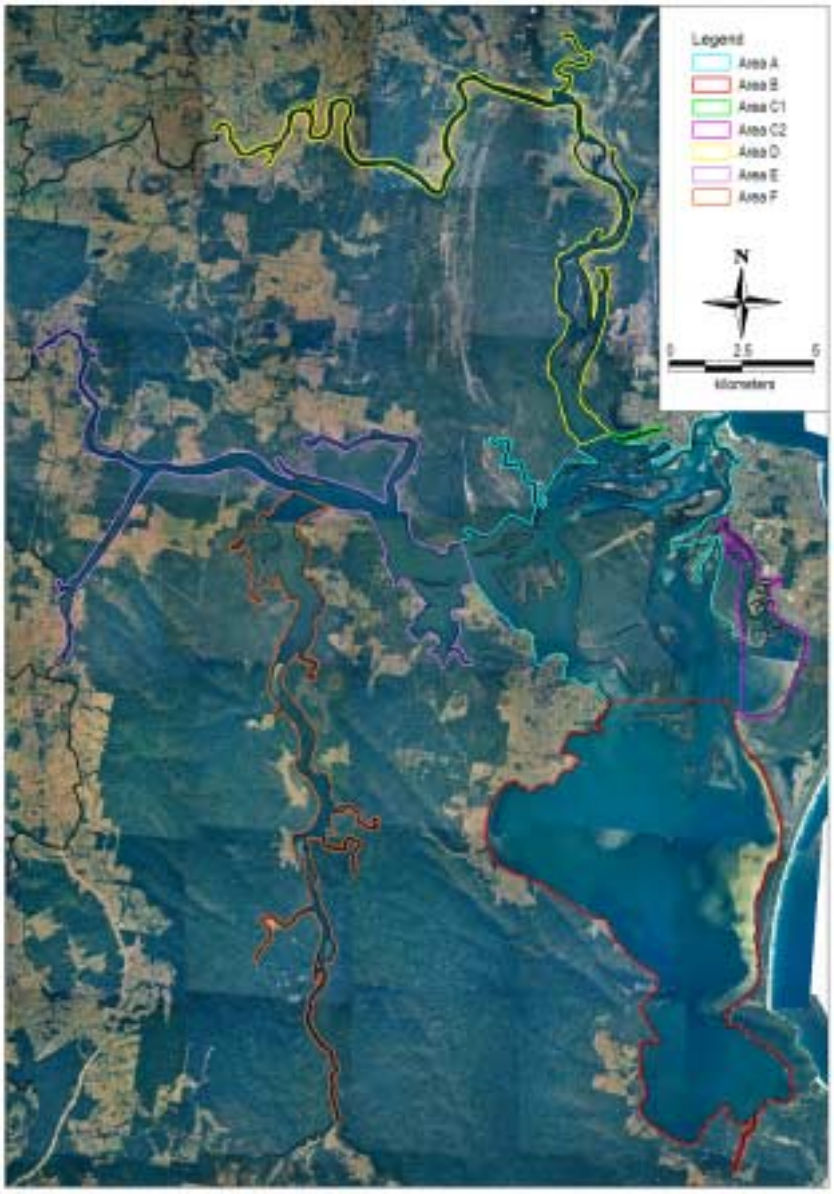


[Figure 2.1: The Wallis Lake estuary]

2.2 Current use and Condition

To facilitate a more detailed discussion of the current use and condition of Wallis Lake, the estuary has been divided into *management areas*, with each area having similar ecological characteristics and management needs (Plate 2.1). These areas are:

- **A.** the island/entrance area
- **B.** Wallis Lake water body
- **C.** Muddy Creek, Pipers Bay, Pipers Creek, and Forster Keys
- **D.** Wallamba River
- **E.** Coolongolook and Wang Wauk Rivers, and
- **F.** Wallingat River.



[Plate 2.1: Aerial photograph demarcating estuary management areas within Wallis Lake]

2.2.1 Management area A: Island/Entrance area

Area A includes the island/entrance estuary and foreshore area of the Lake (Figure 2.3) covering Cape Hawke Harbour to the Wallamba broadwater in the east, Rose Point in the southwest, and Coomba Park and Green Point in the south.

AREA A:
Average waterway depth ≈ 2.8 *m*

The large commercial, residential and tourist developments of Forster/Tuncurry border this area. Much of this development occurs immediately adjacent to the foreshore area on Cape Hawke Harbour in Tuncurry and along Breckenridge Channel in Forster including Pennington Creek.

Commercial users include cruise boats, scuba diving boats, commercial fisherman, fishing charters and oyster farmers (the majority of Wallis Lake's 327 oyster leases are situated in this management area). The area is used for recreation by amateur fishermen and for swimming, paddling, picnicking, power boating and jet skiing. During peak periods (eg long weekends, Easter, Christmas and New Years holidays) the area experiences a considerable increase in use by these groups.

The main access points to the Wallis Lake estuary in this management area are:

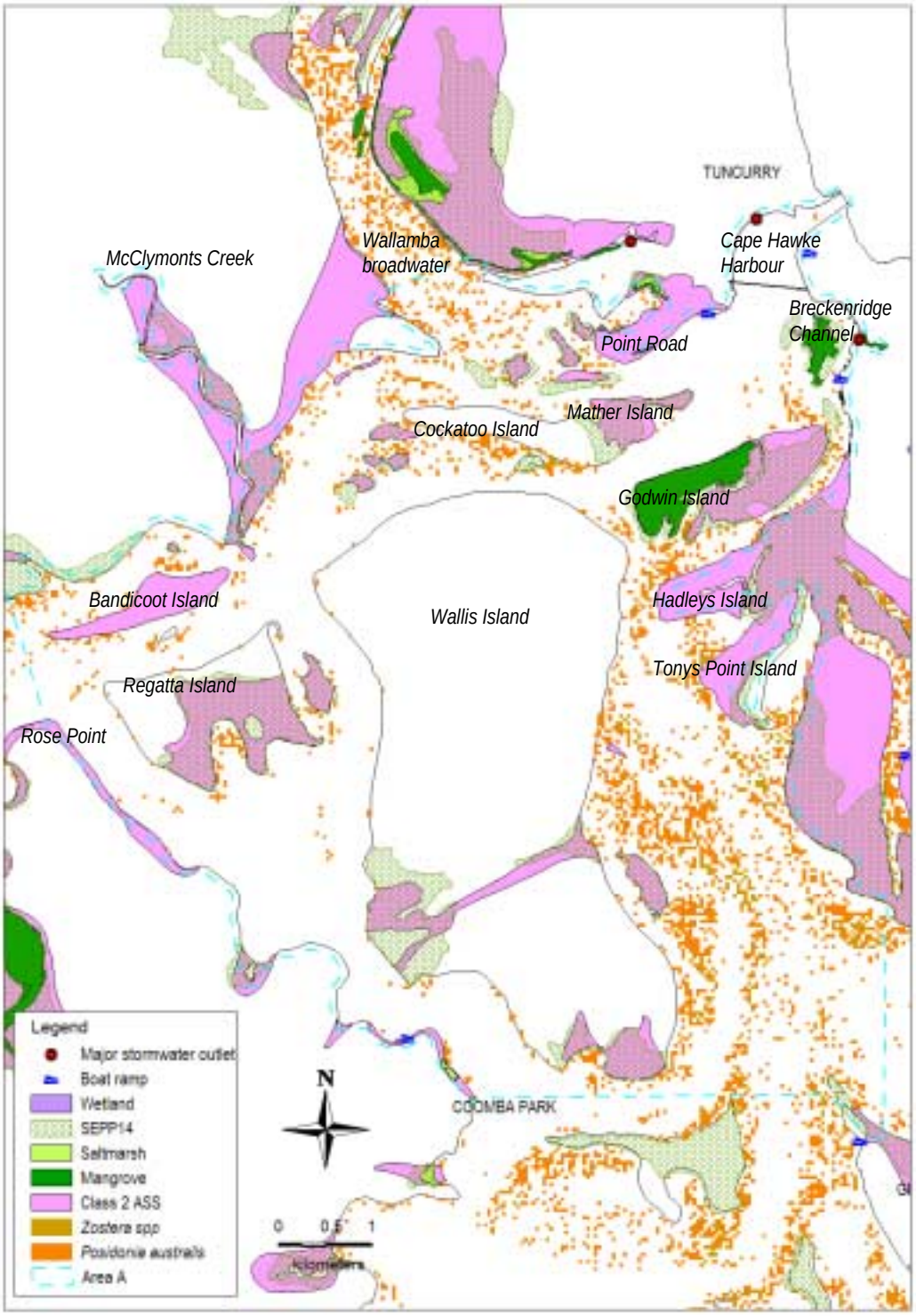
- Point Road – Tuncurry ramp
- Forster Regional Boat ramp (with marina and pump out facilities)
- Paradise marina ramp – Little Street

High densities of moorings are situated in Breckenridge Channel, Cape Hawke Harbour in Tuncurry, and on Point Road in Tuncurry. NSW Fisheries, Department of Lands or Great Lakes Council manages these moorings.

The dynamic movement of sand shoals prevents colonisation by seagrasses close to the entrance. However further from the entrance patches of *Zostera* spp and *Posidonia australis* are present.

SEPP 14 wetland areas are present on a number of the islands in this area including Godwin, Mather, Cockatoo, Regatta and Wallis Islands. Large areas of saltmarsh are located on the southern shore of Regatta and Big Islands.

Further to this, an artificial wetland has been constructed on MacIntosh Street (Mar 1999) to improve stormwater quality from the Pennington Creek catchment.



[Figure 2.3: Management area A: Island/entrance area]

2.2.2 Management area B: Wallis Lake water body

This is the largest area covering the lake and foreshore area to the south of Green Point and Coomba Park, including Wallis Creek (Figure 2.4).

AREA B:
Average waterway depth ≈ 1.8 m

The townships of Green Point and Coomba Park border this area. Though relatively small at present, Coomba Park has been identified in the *Forster/Tuncurry Conservation and Development Strategy* as an area for future urban growth.

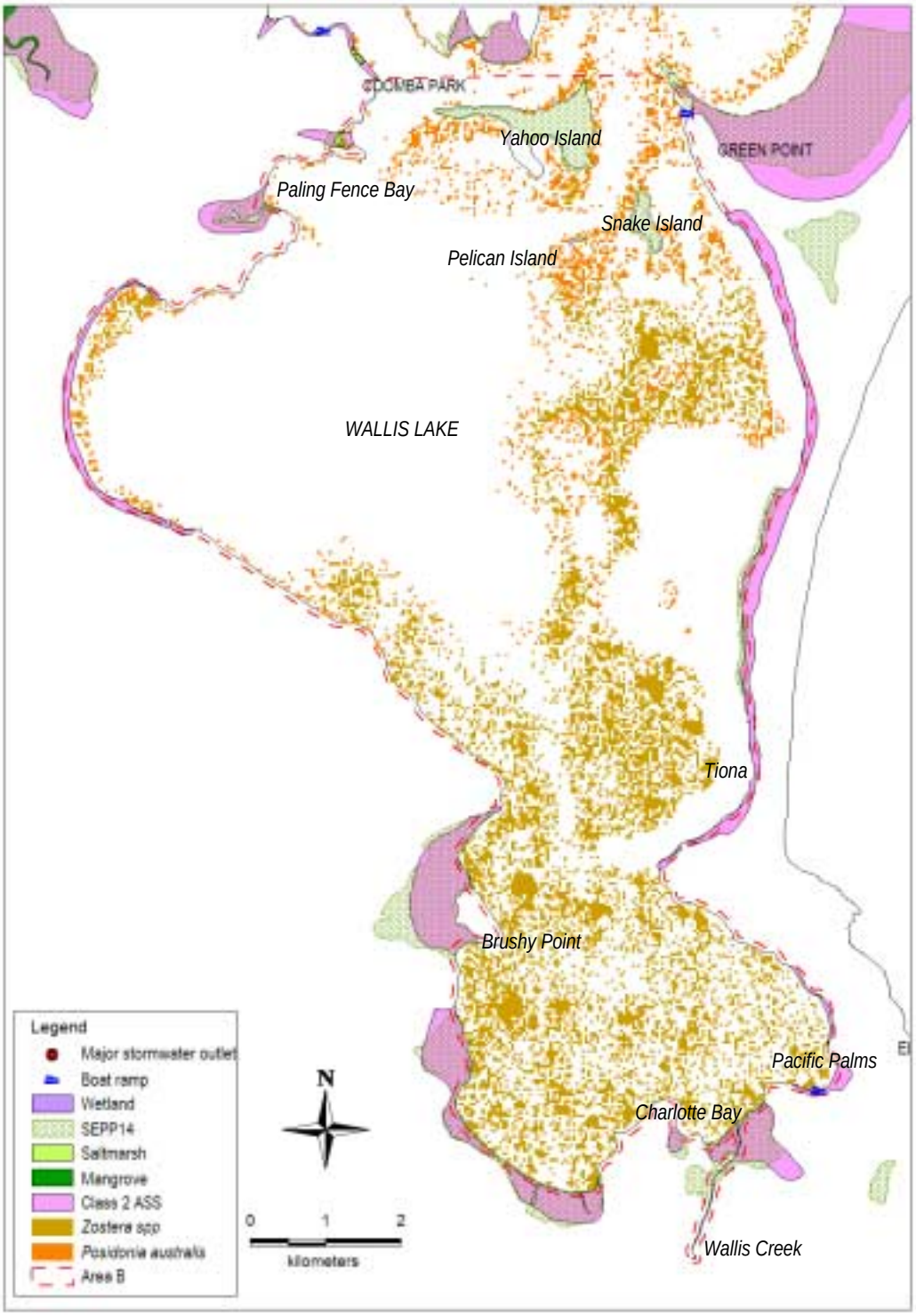
Both commercial and amateur fishermen and commercial cruise boats utilise this area. Recreational activities including swimming, sailing, windsurfing, paddling, power boating and jet skiing.

The main access points to the Wallis Lake estuary in this management area are:

- Green Point
- Sailing Club (private)
- ramp opposite Elizabeth Beach turn-off
- Pacific Palms ramp (private)
- public ramp 250 m west of Pacific Palms ramp
- Coomba Park (with jetty facility), and
- various unformed access points reached from Coomba Road.

The majority of Wallis Lake's seagrass is present in this area with expansive beds of *Zostera* spp throughout and interspersed beds of *Posidonia australis* in the north. *Ruppia* sp and *Halophila* spp can be found in the northwest of the area with some larger beds in the shallow eastern area between Tiona and Green Point.

SEPP 14 wetland areas are located on Yahoo and Snake Islands, north of Tiona on the foreshore, around Charlotte Bay and Brushy Point, and around Paling Fence Bay south of Coomba Park. An extensive saltmarsh area is also located on the shoreline at Green Point.



[Figure 2.4: Management area B: Wallis Lake water body]

2.2.3 Management area C: Muddy Creek (Wallamba Cove), Pipers Bay, Pipers Creek and Forster Keys

Management Area C1 (Figure 2.5) encompasses Muddy Creek (Wallamba Cove) and Area C2 (Figure 2.6) the Pipers Bay, Pipers Creek and Forster Keys area. These areas are densely urbanised canal estates (or the receiving area of these) and experience little flushing.

Denitrification efficiency in Muddy Creek (Area C1) is low at 50% during summer (Smith and Heggie 2003). Denitrification is an important natural way for estuaries to cleanse themselves of excess nitrogen. It is a process by which nitrogen from plant organic material is converted to nitrogen gas by bacteria and lost to the atmosphere. If this process is not operating efficiently, the organic nitrogen is instead converted to dissolved inorganic forms (nitrate, nitrite and ammonia) and is available for plant growth. A denitrification efficiency of 40% or less is thought to be a sign of deteriorating water and sediment quality, so the value of 50% measured in Muddy Creek is poor. A phytoplankton bloom caused by *Microcystis* sp from March until May 2002 is testament to this and a sign that excess nutrients are in the system.

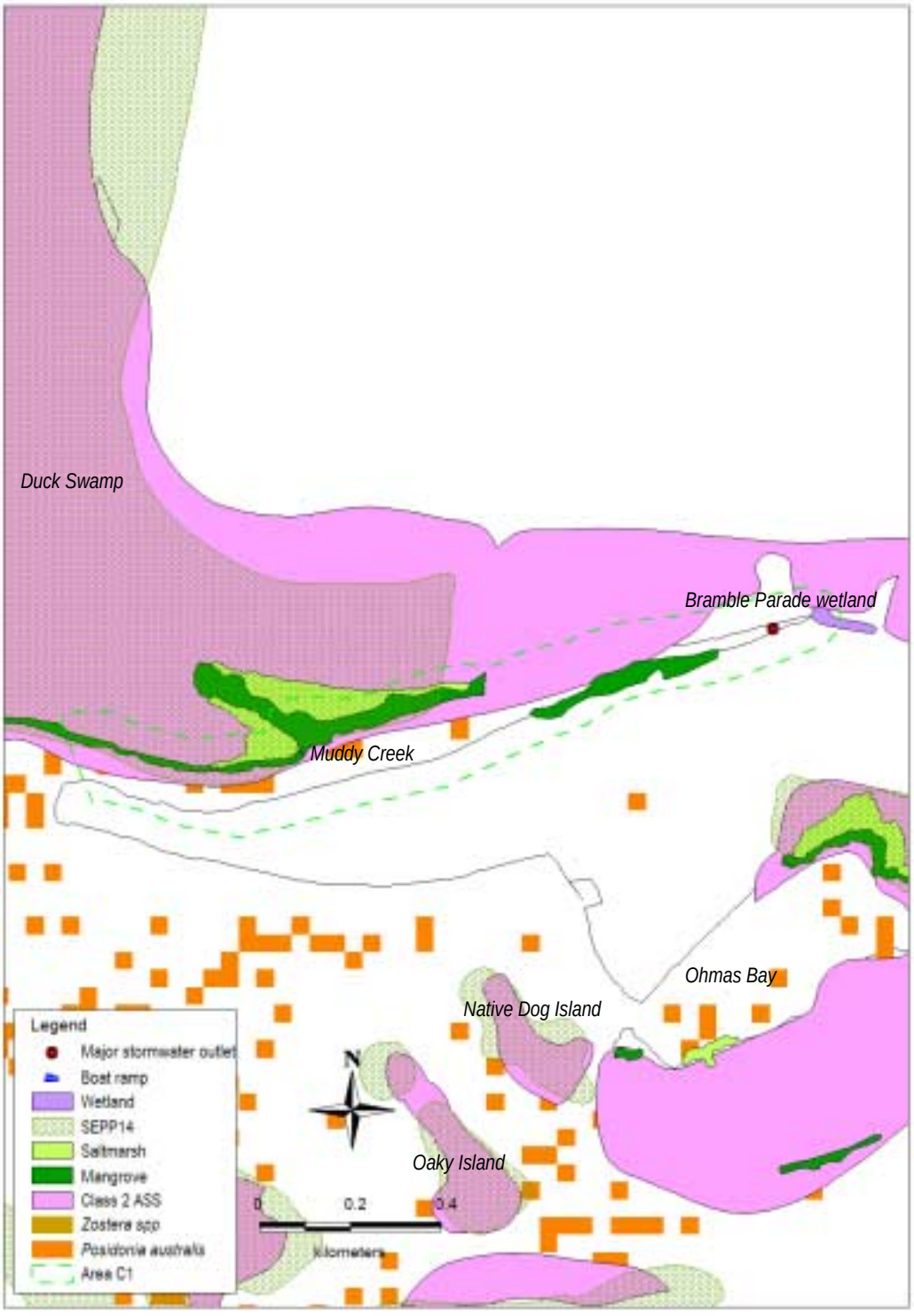
To alleviate the nutrient (and sediment) loads entering Muddy Creek an artificial wetland was constructed on Bramble Parade in April 2002. Artificial wetland areas act as filtration systems fixing much of the nutrients from stormwater in the native vegetation and allowing sediments to settle out before entering the estuary. These constructed wetlands can reduce the nitrogen load by up to 30%. However, there is limited information available to date on the performance of the artificial wetlands constructed in the Wallis Lake catchment.

Pipers Creek and Forster Keys (Area C2) is the receiving area for stormwater from the Forster Keys and Wyuna catchments. The catchment area has largely been cleared for residential and commercial purposes, resulting in significant nutrient inputs and possible faecal pollution entering the estuary particularly after rain (Webb, McKeown & Assoc. 1999). Five artificial wetlands have been constructed in this catchment at Goldens Road north (Dec 2002) and south (Mar 2003), Kularoo Drive (Dec 2003), Boronia Street (2004) and Townsend Street (Nov 2001). Further to this, 1 GPT has been installed at Kularoo Drive.

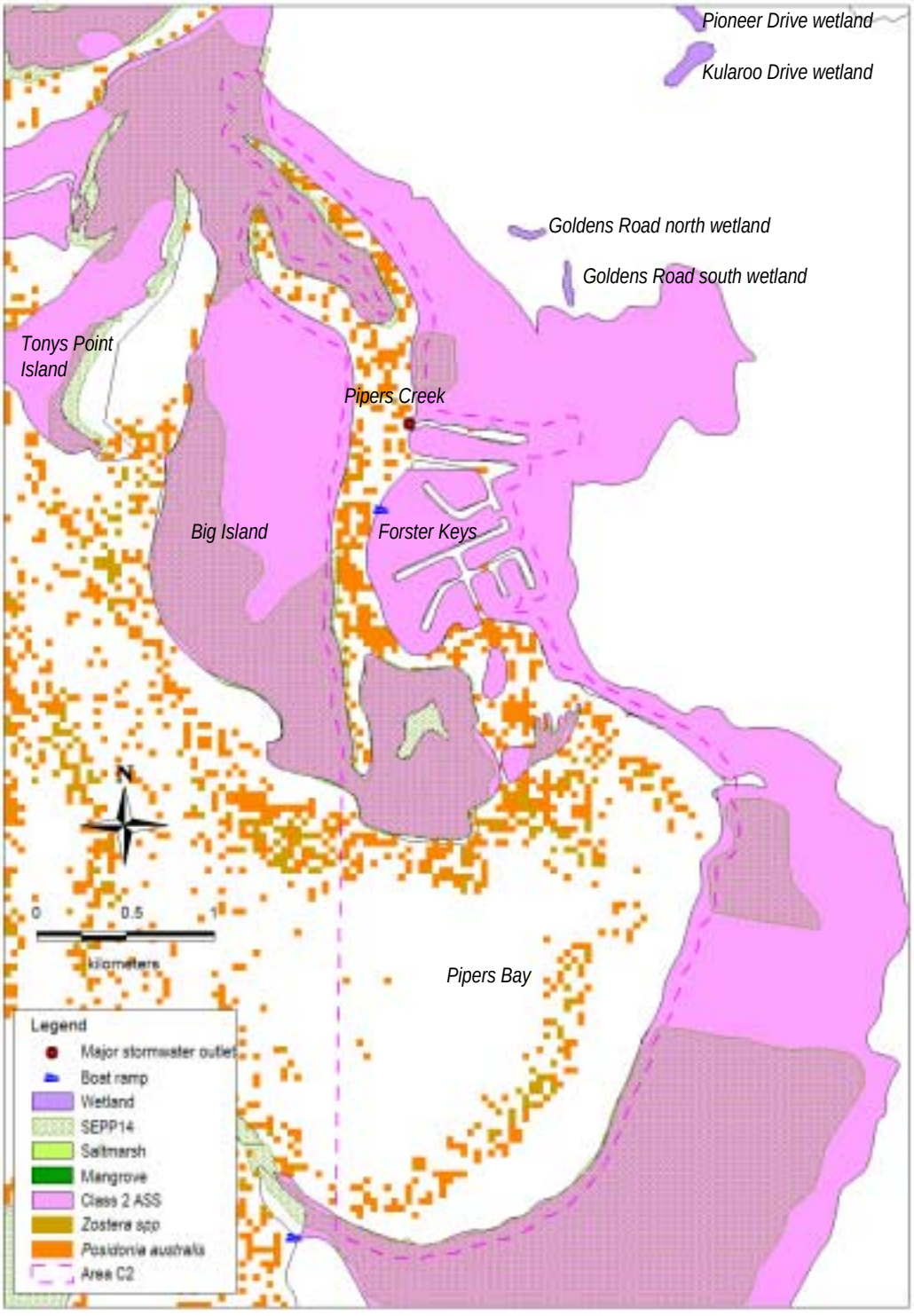
Evidence of nutrient enrichment in Area C2 is a persistent bloom of the green filamentous macroalgae *Chaetomorpha* sp. This alga has been observed forming large mats in shallower areas of the Creek since December 2000 (S. Moore pers. obs.) and sporadically in the Forster Keys and in Pipers Bay. Further, denitrification efficiency is just 38% in Pipers Creek during summer months (Smith and Heggie 2003). This is less than the 40% value indicating poor water and sediment quality, and means that during summer ammonia (a highly available plant nutrient) is leaching out of the sediments into the surrounding water column and is available for plant growth.

SEPP 14 wetland areas are present on much of Big Island and in the upper reaches of Pipers Creek.

No public access to the Lake is available in Area C1 at Muddy Creek, however access in Management Area C2 is obtained via the Forster Keys ramp.



[Figure 2.5: Management area C1: Muddy Creek]



[Figure 2.6: Management area C2: Pipers Bay, Pipers Creek and Forster Keys]

2.2.4 Management area D: Wallamba River

Area D encompasses the Wallamba River from the broadwater upstream to the tidal limit at Clarksons Crossing in Nabiac (Figure 2.7). The township of Nabiac is situated at the upper tidal limit and the smaller township of Failford is located further downstream.

AREA D:
Average waterway depth ≈ 1.9 m

Environmental issues resulting from land clearing for agricultural use in the Wallamba River catchment include nutrient enrichment (Carter 1999) and faecal contamination from livestock (Logan *et. al.* 2001). In areas where stock has access to the riverbank, riparian vegetation is degenerated contributing to riverbank erosion.

Large volumes of acid product enter the estuary during times of rain from Darawakh Creek due to past drainage works disturbing acid sulphate soils in the Darawakh wetland and Frogalla Swamp area. The fishing and oyster aquaculture industries are especially affected by this problem.

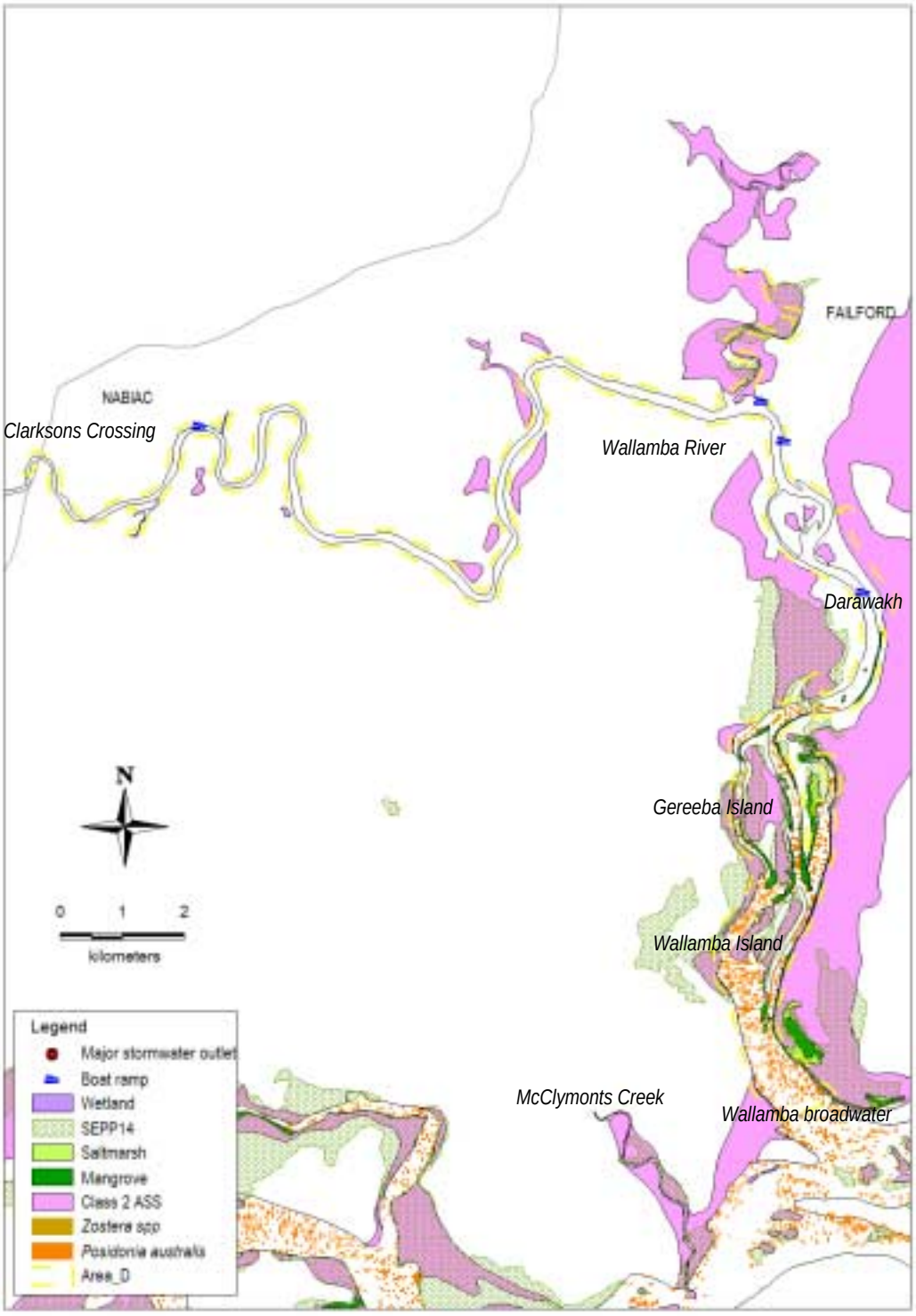
Fish kills in the upper reaches of the Wallamba River during summer in 1999 and again in 2003 are signs of localised eutrophication. Eutrophication is the process of excess plant growth causing algal blooms, particularly of phytoplankton and free floating macroalgae. This plant organic matter consumes oxygen as it decomposes on the estuary bed, causing deoxygenation of bottom waters in the area. Consequently, asphyxiation is thought to be the cause of the Wallamba River fish kills that affected Australian bass, mullet, bream, catfish and eels. The presence of a barrier at Clarksons Crossing is likely to have significantly contributed to these events by inhibiting fish passage downstream to more oxygenated waters.

Waterskiing and wakeboarding is popular in the lower Wallamba River contributing to erosion in the area, particularly at 'turn around points' and in areas of high/steep riverbank. Commercial and recreational fishermen also utilise the area and oyster aquaculture takes place in the broadwater.

The estuary can be accessed at:
- Nabiac (Wharf Street)
- Riverside Drive
- Willow Point Road (Dirt ramp)
- Willow Point Road (Concrete ramp)

Access can also be gained at the two major private ramps at Shalimar Ski and Caravan Park and the River Inn Caravan Park.

Patches of *Zostera* spp are present in the lower sections of the river and SEPP 14 wetland areas with some patchy saltmarsh areas are present along the foreshore of the lower Wallamba River and on Gereeba and Wallamba Islands.



[Figure 2.7: Management area D: Wallamba River]

2.2.5 Management area E: Coolongolook and Wang Wauk Rivers

The Coolongolook and Wang Wauk River system form Management Area E encompassing the area upstream from Rose Point (including Shallow Bay and Minimbah Creek) to Locketts Crossing on the Coolongolook River and to the Pacific Highway on the Wang Wauk River (Figure 2.8).

Due to large areas of land cleared for agriculture, similar problems identified in Area D (Wallamba River) occur in this management area being nutrient enrichment, faecal contamination from livestock and erosion.

Water skiing occurs on the Coolongolook River, however it is much less intensive than on the Wallamba River. The area is very popular with commercial fishermen.

SEPP 14 wetland areas border the estuary in this management area downstream of the Wang Wauk and Coolongolook River confluence, surrounding Minimbah Creek and around Shallow Bay. Within these areas extensive saltmarsh communities are located on Minimbah Creek.

Access to the upper navigable reaches of the Coolongolook River is via a ramp close to Coolongolook.

2.2.6 Management area F: Wallingat River

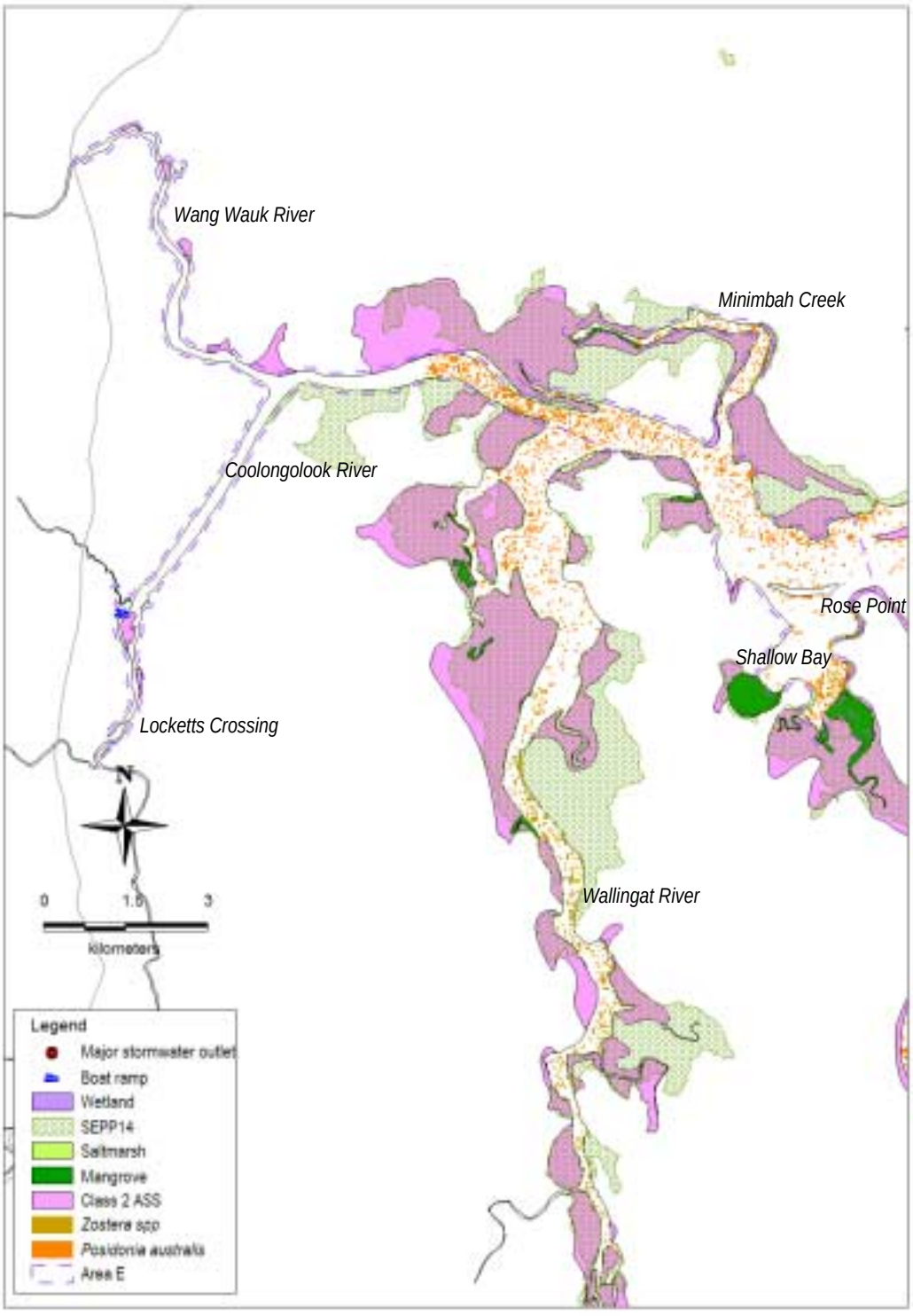
The Wallingat River from the Coolongolook confluence (including Mills Island) upstream to the Tea Tree Creek confluence comprise Area F (Figure 2.9).

The Wallingat River has experienced little human impact with only 18% of the catchment cleared and the majority either State Forest or National Park. There are no major townships on the banks of the river.

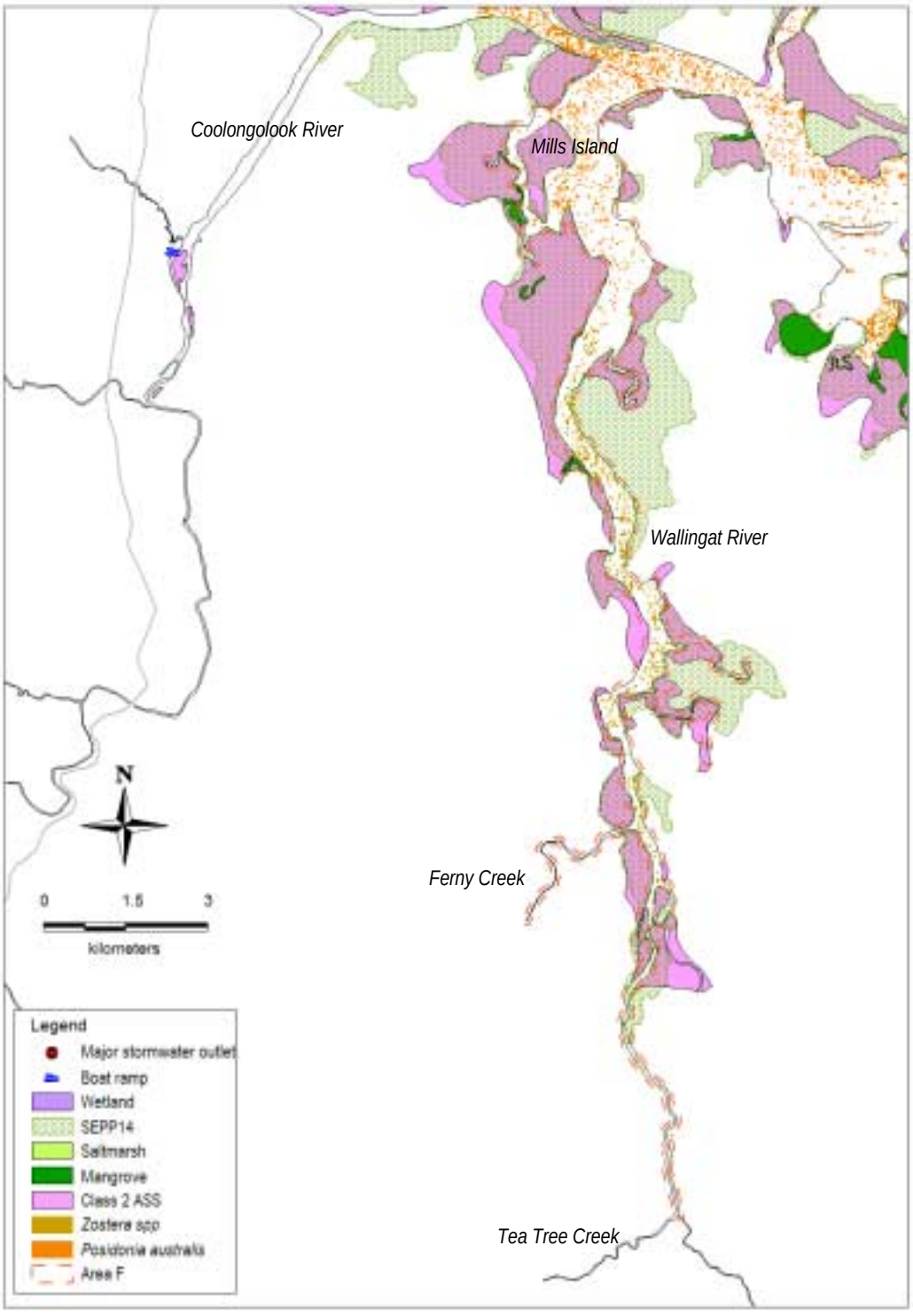
Much of the foreshore area along the length of the Wallingat River is classified as SEPP 14 wetland including areas on Mills Island. In addition extensive saltmarsh communities are located on the shoreline west of Mills Island.

The management area is utilised by commercial fishermen and for recreation by water skiers, wakeboarders and by paddle craft.

The estuary can be accessed by a ramp within the Wallingat National Park in the upper reaches of the management area.



[Figure 2.8: Management area E: Coolongolook and Wang Wauk Rivers]



[Figure 2.9: Management area F: Wallingat River]