STATE OF THE DERWENT

Year **2011** Report Card

THE DERWENT ESTUARY

The Derwent estuary lies at the heart of the Hobart metropolitan area and is a waterway of great natural beauty and diversity. Named after the Celtic word 'clear water' in 1794, the Derwent is an integral part of Tasmania's cultural, economic and natural heritage. The estuary is an important and productive ecosystem and supports a wide range of habitats and species.

R. Stuart-Smith

Approximately 40% of Tasmania's population - 202,000 people - live around the estuary's margins. The Derwent is widely used for recreation, boating, fishing, marine transport and industry. Further upstream, the River Derwent supplies the majority of the region's drinking water supply and is a major source of hydroelectric power.

A number of environmental issues affect the Derwent estuary, in particular:

- heavy metal contamination;
- introduced marine pests;
- loss of estuarine habitat and species;
- intermittent faecal contamination of recreational waters;
- depressed oxygen levels and organically enriched sediments;
- elevated nutrient concentrations;
- environmental flows and barriers, and;
- impacts of climate change.

Although there have been significant improvements in the treatment of sewage and industrial wastes over the past decade, the Derwent still faces a number of environmental challenges. A strategic and coordinated planning approach across all levels of government, industry and the community is our best hope for a clean and healthy estuary in the future.

MANAGEMENT AND RESTORATION

The Derwent Estuary Program (DEP) was established in 1999 as a partnership to restore and protect the Derwent estuary. The program has been successful in bringing together a wide range of stakeholders – firstly to build a common understanding, vision and management framework – and secondly to progressively implement this vision through partnership agreements and practical actions.

The program was initially designed to address environmental quality issues such as industrial and urban water pollution, contaminated sediments, introduced species and loss of estuarine ecosystems. More recently, foreshore issues have also been included within the program. Key aspects of implementation include environmental monitoring and reporting, coordination of regional activities, and implementation of priority projects such as stormwater management, heavy metal investigations and conservation of key estuarine habitats and species.

The DEP is supported by the Tasmanian Government, six councils that border on the estuary (Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough Councils) and five business partners (Nyrstar Hobart, Norske Skog Boyer, Southern Water, TasPorts and Hydro Tasmania). Other project partners include the Australian Government, University of Tasmania, CSIRO, NRM South, local businesses and community groups.

In 2010, the DEP was awarded Australia's National River*prize* for excellence in river management.

Derwent Estuary Program

ENVIRONMENTAL MONITORING AND REPORTING

A fundamental requirement for effective natural resource management is an on-going and reliable source of environmental data. This principle forms the basis of the DEP's cooperative monitoring program between the state government, councils, industries and research institutes. Formerly independent monitoring programs are now coordinated so as to provide better information on the estuary as a whole, and to report annually on environmental conditions and trends in the Derwent.

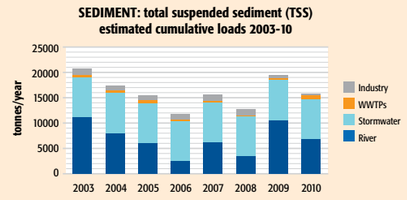
This 'Report Card' summarises monitoring data collected by the DEP and our partners, as well as other relevant information collected during 2010-11, including:

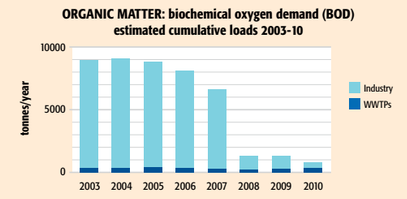
- weekly recreational water quality testing during summer months;
- monthly whole-of-estuary water quality monitoring;
- surveys of heavy metal levels in fish and shellfish;
- surveys and mapping of seagrass and rocky reef habitats; and
- weed surveys and control actions.

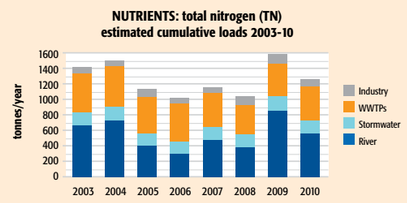
More detailed information is published in five-yearly State of the Derwent Estuary reports, available on our website: **www.derwentestuary.org.au**

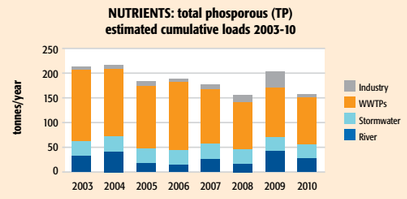
INTERNATIONAL RIVERFOUNDATION RIVERPRIZE 2010 NATIONAL RIVERPRIZE WINNER

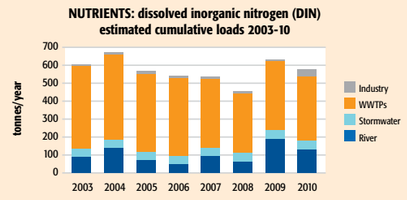
POLLUTION SOURCES, LOADS AND TRENDS

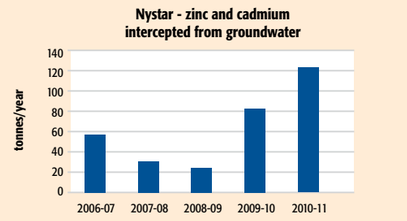












Pollution enters the Derwent estuary from many sources, commonly referred to as 'point sources' and 'diffuse sources'. Point sources include sewage treatment plants and large industries, such as the Norske Skog paper mill at Boyer and Nyrstar Hobart zinc smelter at Lutana.

Diffuse sources include stormwater runoff from urban areas and the larger catchment inputs carried by the Derwent and Jordan rivers. Other diffuse sources include landfills and contaminated sites, air pollution, aquaculture operations, and wastes associated with shipping, ports and marinas. Sediments within the estuary itself may also release pollutants into the overlying waters under certain conditions.

Contaminants released or transported into the Derwent from these various sources include pathogens, nutrients, organic matter, silt, litter and a range of toxicants including heavy metals, resin acids and hydrocarbons.

Sewage treatment plants are the largest point sources of nutrients to the estuary. Since 2003, nutrient loads from sewage treatment plants have decreased by about 25%, due to a combination of improved treatment and effluent reuse.

Nearly 15% of the treated sewage effluent from the Hobart metropolitan area is now reused to support agriculture and other beneficial uses.

Industries are the largest point sources of organic matter and heavy metals to the estuary, however inputs of these pollutants have declined significantly in recent years. Since 2007, organic loads from the Norske Skog paper mill have fallen by over 90% (see text box below). At the Nyrstar Hobart smelter, projects to collect and treat contaminated groundwater and stormwater (which previously entered the Derwent) captured over 120 tonnes of zinc and other heavy metals in 2010-11.

Urban stormwater contributes the majority of faecal bacteria to the estuary, derived from animal droppings, aging infrastructure, sewage overflows, and cross connections between the sewage and stormwater systems. Stormwater is also the largest estimated source of sediments and litter.

Catchment and Channel: Recent studies suggest that diffuse inputs of nutrients from both the River Derwent catchment and the D'Entrecasteaux Channel play a key role in the health of the estuary. The amount of water released from the catchment is also an important factor for both water quality and ecosystem health (see text box on Water Quality Improvement Plan).

MAJOR IMPROVEMENTS IN WASTEWATER TREATMENT AT NORSKE SKOG BOYER

The Norske Skog paper mill is located on the Derwent estuary at Boyer – 4 km east of New Norfolk. The mill has been operating since 1941 and is Australia's largest producer of newsprint and specialty newsprint papers. In 2007, the mill completed a major upgrade of the wastewater treatment plant to improve treatment of dissolved organic matter and other contaminants. In 2009, the mill also converted to pine-only processing – further reducing the levels of organic matter in their wastewater. As a result, annual discharges of organic matter from the mill have fallen by over 90% - from 6500 tonnes in 2007 to less than 500 tonnes in 2010, and the colour of the effluent has also changed dramatically from dark tea-coloured to clear. This represents a major 'step change' in environmental conditions in the upper estuary – an area with extensive wetlands and seagrasses that provide important habitat for birds and fish. A number of studies have recently been completed to document how the upper estuary is responding to this change, through collaborations between the DEP, University of Tasmania, Norske Skog Boyer and with support from the Australian Government.

DERWENT WATER AND SEDIMENT QUALITY

SWIMMING IN THE DERWENT

Each summer, recreational water quality is monitored at about 35 beaches and bays around the estuary through a collaborative State and Local Government program. Sampling is conducted weekly from December through March, at the locations shown on the map overleaf. To describe the risk level to swimmers a colour coded system is used, based on 5 years of monitoring data: green indicates good, yellow indicates fair and red indicates poor water quality.

Nine of the Derwent's 18 swimming sites are currently classified as having good water quality, 7 are fair and 2 are poor. The best water quality was measured at New Norfolk Esplanade, Little Sandy Bay, Hinsby, Taroona, Kingston (middle), Blackmans Bay, Little Howrah and Opossum Bay. Windermere beach and the western end of Nutgrove beach received poor water quality ratings. Investigations are planned to identify and address pollution sources at these sites.

Of the 19 bays, coves and other sites monitored, 5 have good water quality, 7 are fair and 7 are poor (in particular at Marieville Esplanade, Cornelian Bay, Hobart Rivulet and Browns River). Significant improvements were noted in recreational water quality at several sites – particularly around Sullivans Cove – while water quality declined at Lindisfarne Bay.

Most urban areas experience poor water quality after heavy rain. Swimming is not recommended in the Derwent for several days after heavy rain and never in the vicinity of stormwater drains or urban rivulets.

WATER QUALITY INDICATORS

The DEP coordinates a comprehensive whole-of-estuary monitoring program that integrates sampling carried out by the DEP and EPA Division, Nyrstar Hobart, Norske Skog and Southern Water. Water quality is tested each month at 28 sites between New Norfolk and the estuary entrance near the Iron Pot lighthouse, and one site at Bryn Estyn. Sites are monitored for indicators such as temperature, salinity, dissolved oxygen, suspended solids, nutrients, organic carbon, chlorophyll a and heavy metals.

Dissolved oxygen levels in the Derwent are generally high except periodically in the area between Bridgewater and New Norfolk. During summer months when water temperatures are high and river flows are low, the deeper channels in this area tend to be oxygen poor, with adverse impacts on bottom-dwelling organisms.

Although *nutrient enrichment and nuisance algal blooms* have not been a major concern in the Derwent to date, increasing development in the catchment and D'Entrecasteaux Channel is predicted to result in higher nutrient loads and associated algal growth. High chlorophyll a levels are regularly observed in Prince of Wales Bay, and there have been reports of increasing macroalgae in some bays

CONTAMINATED SEDIMENTS

Levels of heavy metals in Derwent estuary sediments are among the highest in Australia. Derwent sediments tend to be fine-grained and organic-rich and significantly exceed national sediment quality guidelines for zinc, copper, mercury, lead, cadmium and arsenic. Recent surveys suggest that heavy metal levels are starting to decline – particularly within the most heavily contaminated middle estuary – in response to improved industrial practices.

DERWENT ESTUARY WATER QUALITY IMPROVEMENT PLAN (WQIP)

In 2009/10 the DEP completed a plan to manage heavy metals and nutrients, funded through the Australian Government's Coastal Catchments Initiative, in collaboration with scientific and industry partners. Stage 1 of the WQIP investigated heavy metal sources, sinks and processes, including a number of sediment process studies. Hydrodynamic, sediment transport and toxicant models were developed and used to evaluate alternative management scenarios and to derive load-based targets.

A second stage WQIP was then developed, incorporating nutrient response models. Nutrient inputs to the Derwent are increasingly dominated by marine and catchment inputs, with sewage treatment plants providing a declining share. Modelling results for a range of nutrient loading and river flow scenarios predict an increase in chla and a decline in dissolved oxygen levels with increasing nitrogen loads and reduced river flows. This has significant implications for sediment-bound heavy metals, which appear to be more bioavailable under low-oxygen conditions. The WQIP also highlights the role of estuarine sediments in mitigating nutrient loading, with the majority of nitrogen removed via denitrification.

The WQIP provides an important scientific basis for targeting management actions more effectively. Recommended actions include:

- Continue to remediate heavy-metal contaminated groundwater and stormwater at the Nyrstar Hobart zinc works;
- Manage nutrients from all sources (catchment, Channel, sewage and stormwater) to minimise algal blooms and low oxygen levels, and conserve areas with high denitrification potential;
- Manage freshwater flows to preserve estuarine water quality and to maintain critical habitats for fish and birds (wetlands and seagrasses);
- Carry out more detailed studies of heavy metals in fish and biota, and provide better information and awareness about seafood safety.

DERWENT HABITAT AND SPECIES

HEAVY METALS IN SEAFOOD

Oysters and mussels from the Derwent contain high levels of heavy metals, particularly zinc, lead and cadmium. While levels appear to have declined since 2003 in some areas (i.e. above the Tasman Bridge), they are still far in excess of national food standards.

Mercury levels in Derwent-caught flathead have been monitored for many years and have typically been near or slightly above food safety standards, with a gradual increasing trend. Since 2007 mercury levels in other recreationally-targeted fish have also been surveyed, including bream, trout, whiting, Australian salmon, mullet, cod and flounder.

Results have recently been published by the DEP in an updated public information pamphlet *Should I Eat Shellfish and Fish from the Derwent?* Key advice from the Director of Public Health is as follows:

- ***Don't eat shellfish collected from the Derwent (including Ralphs Bay)***
- ***Don't eat any bream from the Derwent and Browns River***
- ***Limit consumption of other Derwent-caught fish to no more than 2 meals/week, or 1 meal/week for pregnant and breastfeeding women and young children***

ESTUARINE HABITAT & SPECIES

Recent surveys of estuarine and foreshore habitats indicate that unvegetated, soft-bottom habitats are by far the most abundant habitats in the estuary (86%), followed by seagrass and macrophytes (7%; primarily in the upper estuary), tidal sandflats (6%; primarily in Ralphs Bay) and rocky reefs (approx. 1%; primarily in the lower estuary).

N.Barrett, IMAS

In 2010/11 detailed surveys of the seagrass beds in the upper Derwent and the rocky reef communities in the mid to lower estuary were completed, providing a baseline assessment of the extent and condition of these key habitats. See overleaf for further details.

1n 2010, 15 whales were sighted in the Derwent – predominantly southern right whales as well as a pod of orcas. Numerous seals and dolphins were also regular visitors. A southern right whale calf was born off Taroona in September 2010 – the first recorded birth in over 150 years.

Biodiversity Conservation Branch, DPIPWE

Monitoring of Derwent little penguin colonies indicate that the numbers of breeding pairs were significantly lower in 2010/11 than in previous years. This may be related to a poor food supply associated with unusual weather patterns, rather than direct mortalities, as few dead birds were observed. Monitoring is continuing in 2011-12.

MARINE PESTS AND WEEDS

The Derwent estuary is extensively colonised by introduced marine species. At least 79 introduced species have been recorded, including 4 that have National Control Plans: northern Pacific seastar, European green crab, Japanese seaweed, and European clam. A number of other species (e.g. New Zealand half crab, New Zealand seastar, and New Zealand screw shell) also pose a significant threat to the ecology of the estuary.

Rice grass – an invasive intertidal weed – has been successfully managed in the Derwent through annual surveys and control actions, and the area of infestation has been reduced from 2 hectares in 1995 to zero in 2010. Surveys will continue annually for at least four more years (approximate seed longevity).

In 2009/10, the DEP began targeting Karamu – a recent introduction from New Zealand. This woody weed is a serious threat to the upper Derwent wetlands, and has already spread 5 km down-river from New Norfolk. See overleaf for further details.

S. Leighton, Southern Tasmanian Councils Authority

CLIMATE CHANGE

Regional risks associated with climate change include inundation of low-lying coastal communities and infrastructure, as well as the loss of critical estuarine ecosystems. Areas of particular vulnerability in the Derwent area include coastal roads, sewerage and stormwater systems, and low-lying rubbish tips and landfills. Estuarine habitats are also at risk from sea level rise, particularly tidal wetlands, saltmarshes and tidal flats, along with the birds, fish and other fauna that depend on these habitats.

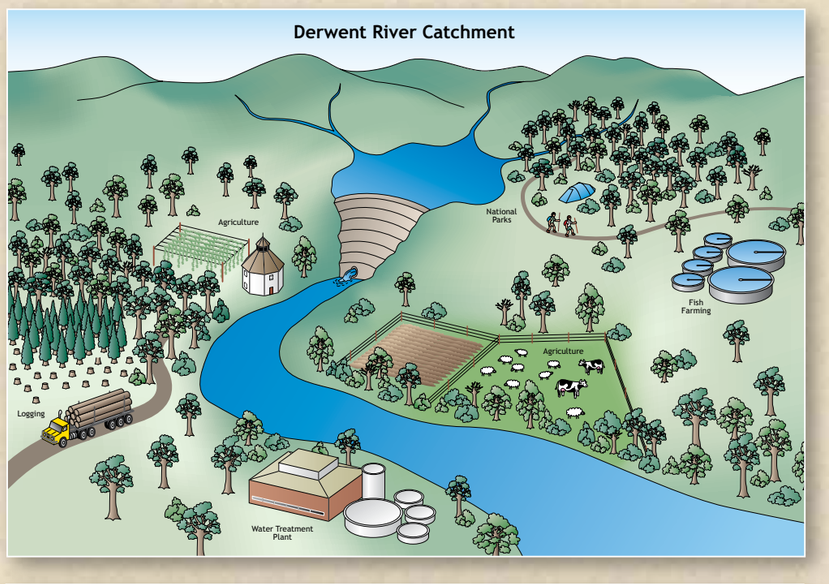
RECENT MANAGEMENT ACTIONS, SAMPLING SITES AND DISCHARGE POINTS

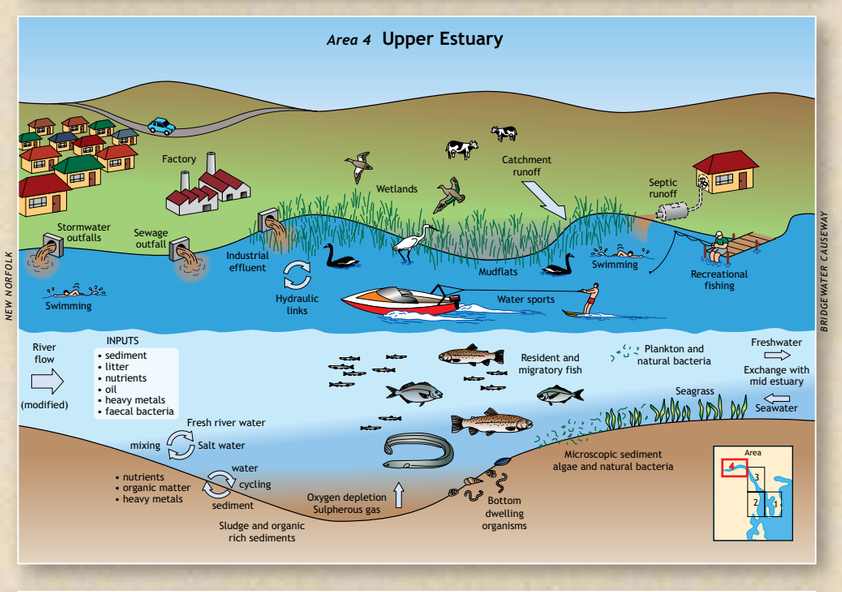
Program partners:

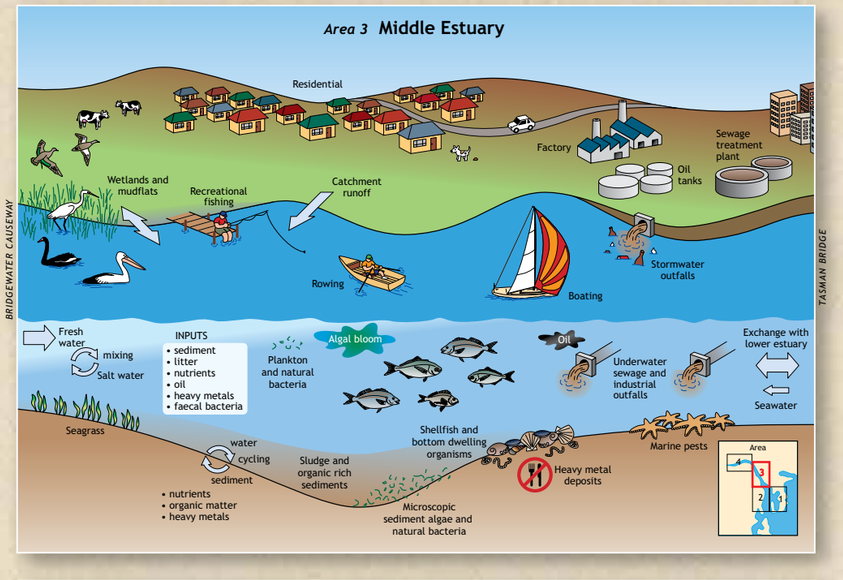
Clarence... a brighter place · Glenorchy City Where ideas happen. · Derwent Valley Council · Brighton Council · Hobart City Council · Kingborough · southern water · TasPorts · Hydro Tasmania The power of natural thinking · Norske Skog Boyer · nyrstar · Caring for our Country · Tasmanian Government

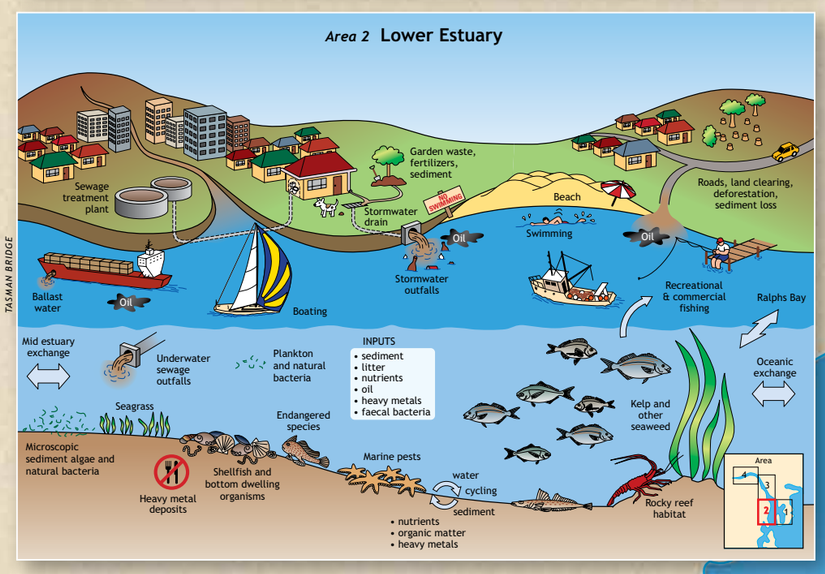
KARAMU MAPPING AND CONTROL

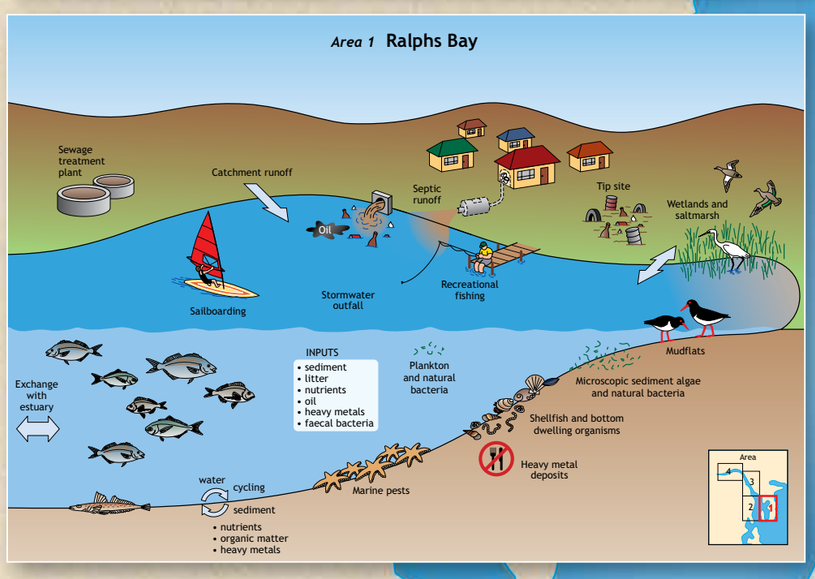
Karamu (*Coprosma robusta*) is a woody shrub native to New Zealand, with shiny leaves and bright red berries. This species has the potential to invade wetlands and riparian zones, and is a declared weed species in Tasmania. Karamu currently has a limited distribution, centred near the town of New Norfolk, but has already spread five kilometres downstream, where it poses a serious threat to the wetlands of the upper estuary. With support from an Australian Government grant, the current distribution of karamu was mapped on 2010 and initial control of outliers was carried out to protect high conservation value wetlands. An integrated control program is planned over the next three years that will establish a containment line, investigate optimal treatment methods, treat outliers and prepare a longer-term management plan for this noxious weed.











RAINGARDENS AT THE UNIVERSITY OF TASMANIA

Water Sensitive Urban Design (WSUD) seeks to minimise impacts of urban run-off on waterways by capturing, treating and infiltrating stormwater on site. WSUD incorporates elements such as permeable pavements, vegetated swales, biofiltration systems ('raingardens'), green roofs and stormwater treatment wetlands within building and subdivision design. Several WSUD projects have recently been constructed to treat stormwater runoff from University of Tasmania carparks, including several small biofiltration cells in the upper campus carpark (near Stanley Burbury Theatre) and a larger WSUD system at the Student Union Carpark (funded through an Australian Government grant). The Student Union raingarden captures stormwater from a largely impervious catchment, filters this through a series of cobbled and vegetated swales and specially constructed sand and gravel matrix, and discharges clean stormwater to the Derwent. As an added bonus, the raingarden serves as an attractive landscape feature.

N.Barrett, IMAS

DERWENT ROCKY REEF SURVEYS

Derwent estuary rocky reef communities extend from the middle estuary to Tinderbox, South Arm and beyond. These temperate reefs provide important and diverse habitat for fish, invertebrates and algae including bastard trumpeter, seadragons, crayfish, abalone and giant kelp forests. In 2010/11 the DEP commissioned a baseline survey of the extent and condition of Derwent estuary reef communities, with support from an Australian Government Grant. The survey – carried out by University of Tasmania scientists – documented extensive and diverse reef communities with 74 recorded species of fish, 147 species of invertebrates and 46 algae species. A strong gradient was observed between middle and lower estuary sites, with lower diversity and high levels of introduced species found at mid-estuary reefs. The DEP survey was complimented by a second regional survey carried out by volunteer divers through the national Reef Life Survey program, which will continue monitoring at key sites into the future.

R. Mount

MAPPING SEAGRASSES IN THE UPPER ESTUARY

The seagrasses of the upper Derwent estuary are made up of a complex mosaic of brackish and saltwater species, including large areas of *Ruppia*. Healthy seagrass beds play a critical role in maintaining water quality, and provide essential habitat for the thousands of swans, ducks and other waterbirds found in the upper estuary. Seagrasses also sustain our fisheries, providing food, shelter, breeding and nursery areas for baitfish, black bream, trout and other recreationally important species. Seagrasses require good water clarity and are sensitive to changes in turbidity, nutrients and salinity. In 2010/11 the DEP commissioned a detailed survey of seagrasses in the upper Derwent by scientists at the University of Tasmania, with support from an Australian Government grant. Using a combination of aerial photography and kayak-based field studies, six major seagrass banks were mapped, with a combined area of 663 ha. See the full report on the DEP website for details.

DERWENT LITTER CAMPAIGN

As part of Clean-up Australia Day 2011, the DEP coordinated a regional Derwent litter campaign which involved 129 business, school and community groups (or 11,661 persons registered) collecting nearly 25 tonnes of rubbish.

Items collected ranged from shopping trolleys and tyres down to tiny pieces of plastic and cigarette butts. A number of litter hotspots were targeted on Business Clean-up Day, including Boyer Road (Norske Skog), Dogshear Point (Cadburys) and Prince of Wales Bay, where over 50 volunteers from Nyrstar, EPA, Veolia Environmental Services, Southern Water and TasPorts joined forces to tackle the worst litter hotspot on the Derwent. As the stormwater system is the major source of litter to the estuary the DEP will continue working on ways to keep stormwater clean including the installation of litter traps in stormwater drains, particularly in busy urban areas. In addition to the DEP's council, state government and industry partners, the Derwent litter campaign was also supported by a grant from the Australian Government and by Veolia Environmental Services.

GEILSTON BAY TRUNK SEWER RELINE PROJECT

The Rosny Wastewater Treatment Plant (WWTP) is the largest on the Eastern Shore and processes 7.5 ML of wastewater/ day from about 11,000 residences. Discharge from the plant is used in the Clarence Recycled Water Scheme, supplying water to farmers in the Coal River Valley. At times, high salinity levels in the Rosny WWTP effluent have prevented its use for irrigation. In September 2010, Southern Water carried out the Geilston Bay Reline Project to reduce saltwater infiltration along a 1.7 km section of sewer trunk line along the Geilston Bay foreshore. The re-lining project involved the sealing of the sewer with a fibreglass liner, and has successfully reduced salinity levels in the Rosny WWTP effluent, increasing the volume of recycled water available. The additional flow available for reuse should reduce sewage-derived nutrient loads to the Derwent by an estimated 5%.

New Norfolk · New Norfolk · Norske Skog Paper · Bridgewater · Bridgewater Causeway · River · Jordan · 14 · 15 · Austins Ferry 1 · Old Beach · Claremont · Dogshear Point · 2 · Cameron Bay · RIVER · 3 · Bowen Bridge · 4 · GLENORCHY · East Risdon · Prince Of Wales Bay · Nyrstar Hobart Smelter · Moonah · 5 · Selfs Point (outfall at Sandy Bay) · New Town · 16 · Lindisfarne · Cornelian Bay · Tasman Bridge · HOBART · Macquarie Point · 6 · 7 · Rosny · 8 · Bellerive · 9 · Sandy Bay · DERWENT · Howrah · 10 · Sandy Bay (outfall from Selfs Point) · Tranmere · Rokeby · Rokeby · Taroona · Lauderdale · Taroona · 11 · 12 · Kingston · 13 · Blackmans Bay · Opossum Bay · Blackmans Bay · RALPHS BAY · Tinderbox · South Arm · Iron Pot · Betsey Island

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kilometres

TASMAP
www.tasmap.tas.gov.au

WATER QUALITY MONITORING SITES IN 2010-11

Beach monitoring site (*enterococci*)
- Good water quality
- Intermediate water quality
- Poor water quality

Ambient moitoring site (temperature, salinity, pH, dissolved oxygen, nutrients, chlorophyll a, metals)

SEWAGE TREATMENT PLANT DISCHARGES IN 2010-11

- < 2500 kL/d
- 2500 - 5000 kL/d
- > 5000 kL/d

INDUSTRIAL DISCHARGES IN 2010-11

- > 50 000 kL/d

WATER SENSITIVE URBAN DESIGN (WSUD) SITES IN 2010-11

1. Austins Ferry vegetated swale
2. Windemere Primary bioretention system
3. Montrose Bay High vegetated swale
4. Guilford Young bioretention swale
5. Transend wetland/permeable pavement
6. Tasmanian Ambulance permeable pavement
7. Menzies Centre stormwater harvesting
8. Princes Wharf #1 stormwater harvesting
9. McRobies landfill litter trap
10. Red Chapel Rd GPT
11. Kingsborough Sports Precinct stormwater harvesting
12. Kingston Bypass WSUD systems
13. St Aloysius vegetated detention basin
14. Transend Brighton – vegetated swale
15. Brighton Bypass WSUD systems
16. Lindisfarne GPTs

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