STATE OF THE DERWENT

Year **2009** 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.

G. Paine

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; and
- environmental flows and barriers.

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 highly successful in bringing together a wide range of stakeholders – first to build a common understanding, vision and management framework – and second to progressively implement this vision through formal 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.

The *Derwent Estuary Environmental Management Plan* was revised in 2009 and endorsed by Tasmania's Premier; the Mayors of Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough Councils; and the CEOs of Norske Skog Boyer, Nyrstar Hobart smelter, Hobart Water (now part of Southern Water) and TasPorts. In 2009, Hydro Tasmania joined the DEP's Steering Committee. The DEP is also supported by many other stakeholders, the Australian Government, NRM South, community groups and research institutions.

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.

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.

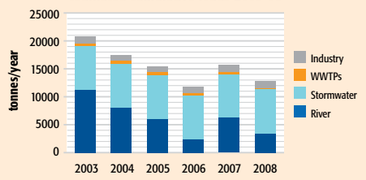
This is our annual 'Report Card' to the community and summarises monitoring data (collected by the DEP and its partners including Analytical Services Tasmania) and other relevant information collected during 2008-09. More detailed information is published in five-yearly *State of the Derwent Estuary* reports, available on our website: **www.derwentestuary.org.au**

Monitoring activities carried out during 2008-09 included the following:

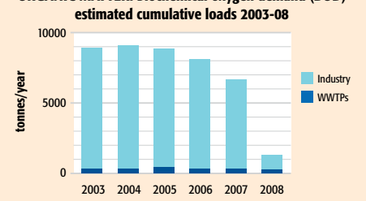
- weekly recreational water quality testing during summer months;
- monthly whole-of-estuary water quality monitoring;
- surveys of mercury in flathead and heavy metals in shellfish;
- surveys and mapping of key estuarine habitats and species; and
- annual rice grass survey.

POLLUTION SOURCES, LOADS AND TRENDS

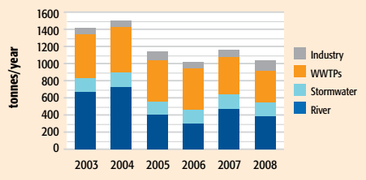
SEDIMENT: total suspended solids (TSS) estimated cumulative loads 2003-08



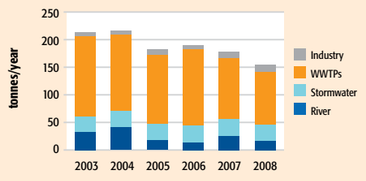
ORGANIC MATTER: biochemical oxygen demand (BOD) estimated cumulative loads 2003-08



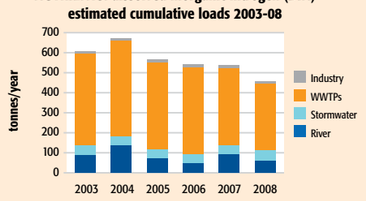
NUTRIENTS: total nitrogen (TN) estimated cumulative loads 2003-08



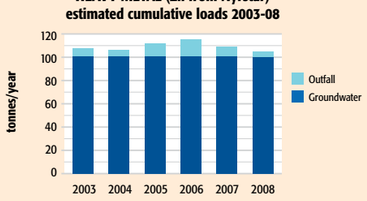
NUTRIENTS: total phosporous (TP) estimated cumulative loads 2003-08



NUTRIENTS: dissolved inorganic nitrogen (DIN) estimated cumulative loads 2003-08



HEAVY METAL (Zn from Nyrstar) estimated cumulative loads 2003-08



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

Non-point sources include stormwater runoff from urban areas and the larger catchment inputs carried by the Derwent and Jordan rivers. Other diffuse pollutant sources include old rubbish tips and contaminated sites, air pollution, aquaculture, 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, wood extractives such as resin acids, silt, litter and a range of toxicants including heavy metals and hydrocarbons.

Sewage treatment plants contribute an estimated 70% of dissolved inorganic nitrogen loads to the estuary. Since 2003, nutrient loads from sewage treatment plants have decreased by about 30%. Of the 12 plants around the Derwent, the Selfs Point and Rokeby plants treat wastes to a tertiary level and three plants reuse treated effluent (Brighton, Bridgewater and Rosny).

Nearly 20% of the treated sewage effluent from the Hobart metropolitan area is now reused to support agriculture and other beneficial uses.

Industrial sources contribute most of the organic matter and heavy metal loads to the estuary. Between 2007-08, organic loads from the Norske Skog paper mill fell by over 80%, following an upgrade of the treatment plant. The majority of metal emissions at the Nyrstar Hobart zinc smelter are from groundwater and stormwater sources, and several major projects were progressed during 2007-2009 to further reduce these, including construction of a 15 ML stormwater treatment system and extension of the groundwater extraction system. Zinc loads from the smelter site have been relatively constant since 2003, but are expected to decline further once the new groundwater extraction system is commissioned.

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 main source of sediments and litter.

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NEW SIGNS ADVISE ON WATER QUALITY AT DERWENT BEACHES

New signs have been installed at beaches and foreshore parks on the Derwent estuary to inform the public about recreational water quality. The water quality signage is based on water monitoring over the past 3 to 5 years and lets people make an informed decision about where and when to swim.

The new signs at popular swimming sites and foreshore parks indicate whether the long-term water quality is good, fair, or poor and can be easily changed if and when sampling results are periodically poor. If weekly monitoring of water quality finds this to be poor at a swimming site, the signs can be opened up to advise the public not to swim until further samples show improvement.

DERWENT WATER AND SEDIMENT QUALITY

SWIMMING IN THE DERWENT

Each summer, councils and the State Government monitor recreational water quality at about 31 beaches and bays around the estuary. Sampling is conducted weekly from December through March, at the locations shown on the map overleaf. The indicator used to detect faecal contamination is *Enterococci*, in line with state and national guidelines. To describe the risk level to swimmers a colour coded system is used (based on 3 to 5 years of monitoring data): green indicates good, yellow indicates fair and red indicates poor water quality.

During the 2008-09 season, most of the Derwent's popular swimming beaches received either good or fair ratings, with the best water quality measured at Opossum Bay, Hinsby and Taroona beaches, Blackmans Bay and Little Sandy Bay. The middle and western end of Howrah Beach received fair water quality ratings, however, the western end is bordering on a poor water quality classification, and investigations are planned to identify and address pollution sources.

Most of the bays in the heavily urbanised middle estuary had poor or fair water quality, except for Kangaroo Bay, Dorans Road (Ralphs Bay) and Sullivans Cove – which had good water quality.

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/Department of Primary Industries, Parks, Water and Environment (DPIPWE), Nyrstar Hobart, Norske Skog and Southern Water. Water samples are collected each month at 28 sites between New Norfolk and the estuary entrance near the Iron Pot lighthouse, and one site at Bryn Estyn. These are monitored for indicators such as temperature, salinity, dissolved oxygen, suspended solids, nutrients, organic carbon, chlorophyll a and heavy metals (zinc is used as an indicator of heavy metal levels).

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. Low oxygen levels may also cause sediment-bound nutrients and metals to be released.

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 likely 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.

The DEP is working in partnership with the University of Tasmania and CSIRO Marine Research to investigate nutrient processes, develop predictive models and recommend nutrient targets to maintain the long-term health of the Derwent estuary. These studies have been funded through Australian Government grants.

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.

Recent studies indicate that the majority of heavy metals in Derwent estuary sediments are strongly bound and do not tend to be released to the water column under normal conditions. However, during low oxygen events, heavy metals may disassociate from sediments, becoming more bioavailable.

MANAGING POLLUTION FROM BUILDING SITES

An estimated 8000 tonnes of sediment reaches the Derwent estuary each year via stormwater runoff and a large percentage comes from soil erosion from building sites. The Derwent Estuary Program has produced a series of fact sheets on soil and water management and provided sediment control kits to councils with funding from NRM South. The sheets are designed to help builders save money by providing information on legal obligations to avoid fines as well as how to improve wet weather working conditions for early completion of buildings. The sediment control kits contained filter socks and filter bales filled with compost to capture and treat sediment and pollutants in stormwater. They were provided to local councils throughout Southern Tasmania, along with training to explain how they work, so they can lead the way in improving work practices.

DERWENT HABITAT AND SPECIES

CONTAMINANT LEVELS IN SEAFOOD

Concentrations of heavy metals in mussels and oysters appear to have declined since 2003 in some regions of the estuary (i.e. above the Tasman Bridge and in Ralphs Bay). However, levels remain well in excess of national food standards and shellfish should not be harvested or consumed from any areas of the Derwent.

Mercury levels in Derwent-caught flathead are also somewhat in excess of recommended guidelines, and a recent pilot survey of mercury levels in other recreationally-targeted fish indicated that levels in black bream were well above guidelines, while levels in estuary trout were somewhat above and mullet were well below. Precautionary health advice was subsequently issued by the Director of Public Health recommending against the consumption of black bream and limiting consumption of other Derwent-caught fish, particularly by pregnant women and children.

In 2009, the DEP released a revised public information pamphlet *'Should I eat Shellfish and Fish from the Derwent?'* The key messages from this brochure are:

- **Do not eat shellfish collected from the Derwent (including Ralphs Bay)**
- **Do not eat Derwent-caught bream**
- **Limit consumption of other Derwent-caught fish to no more than 2 meals/week, or 1 meal/ week for pregnant 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). The Derwent foreshore retains 49% of its native vegetation, including 12 threatened vegetation communities.

More detailed information produced in 2008-09 is provided in the *Derwent Estuary Habitat Atlas* which can be accessed on the LIST internet site (**http://www.thelist.tas.gov.au**).

Work by community volunteers, project officers and supporting organisations appears to be paying off as an increase in penguin breeding pairs has been observed. In 2004-05 a baseline survey identified 98 breeding pairs at sites along the estuary foreshore. Monitoring over the 2008-09 season saw an increase in active nests. There are now 177 breeding pairs across 13 sites. Further restoration was achieved and protection of breeding habitat through sites works (e.g. revegetation, burrow installation, fencing and signage). Little penguin management guidelines were released at a forum to promote and help conserve this species and its habitat. The Derwent Estuary Program Penguin Project has been funded by the Australian Government Envirofund program.

INTRODUCED MARINE SPECIES

The Derwent estuary is extensively colonised by introduced marine species. At least 79 introduced species have been recorded, including four that have National Control Plans: northern Pacific seastar (*Asterias amurensis*), European green crab (*Carcinus maenas*), Japanese seaweed (*Undaria pinnatifida*), and European clam (*Varicorbula gibba*). 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 (*Spartina anglica*) – 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 about 4 square metres in 2009. Surveys will continue annually for at least six years (approximate seed longevity) until no rice grass is found.

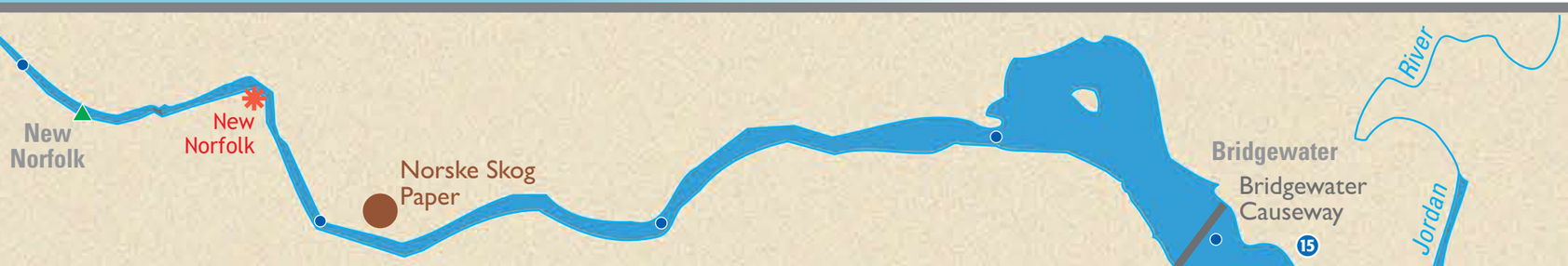
CSIRO

CLIMATE CHANGE

Regional risks associated with climate change have been investigated through several recent studies, and include inundation and erosion of low-lying coastal communities and associated infrastructure, as well as the loss of critical estuarine ecosystems. Areas of particular vulnerability in the Derwent area include low-lying communities such as Lauderdale and Kingston Beach, coastal roads, sewerage and stormwater systems and low-lying rubbish tips and landfills. There are also a number of key estuarine habitats 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.

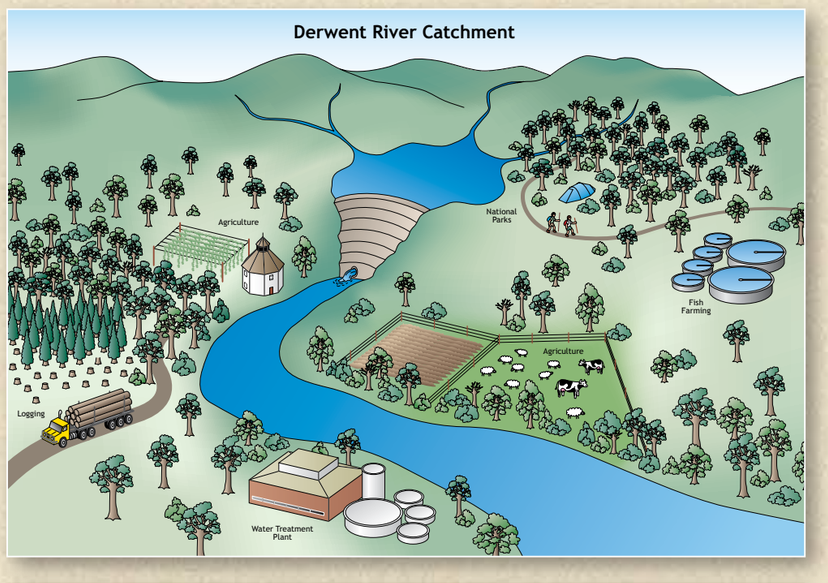
RECENT MANAGEMENT ACTIONS, SAMPLING SITES AND DISCHARGE POINTS

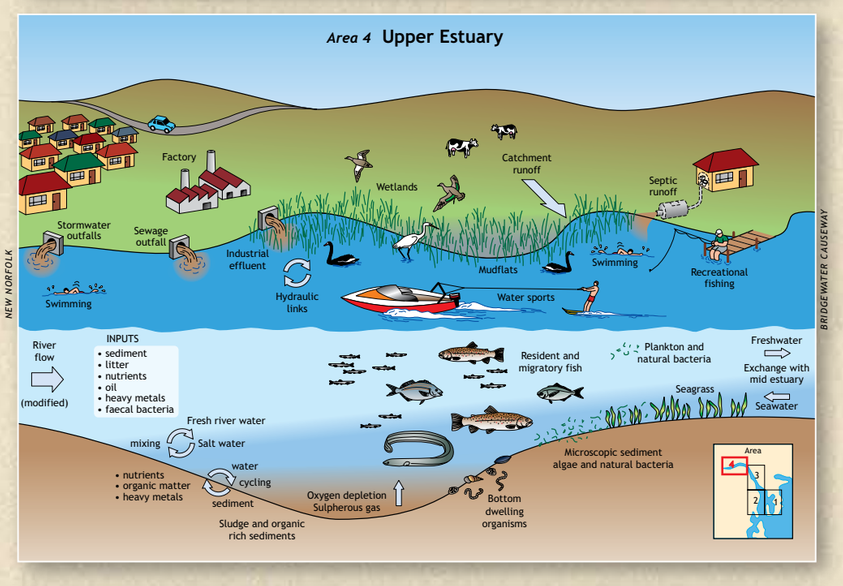
Program partners:

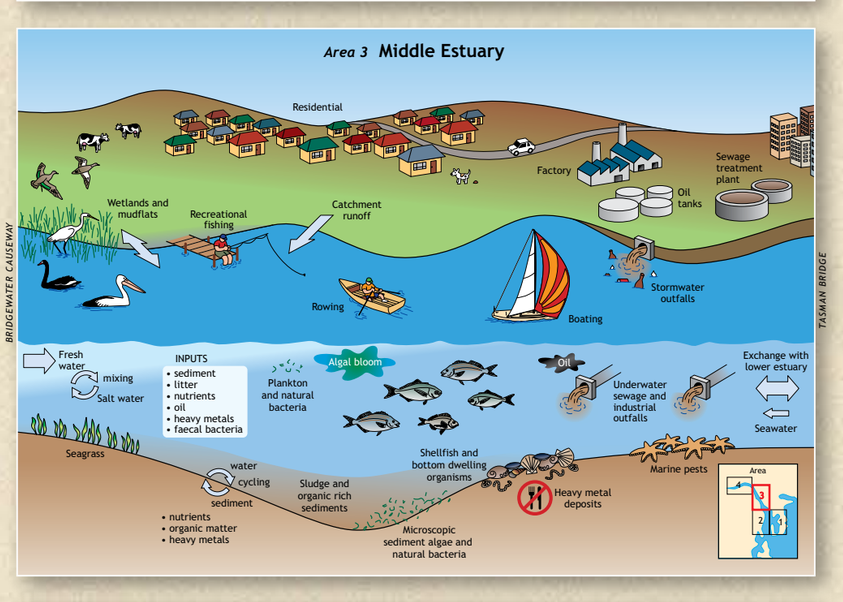


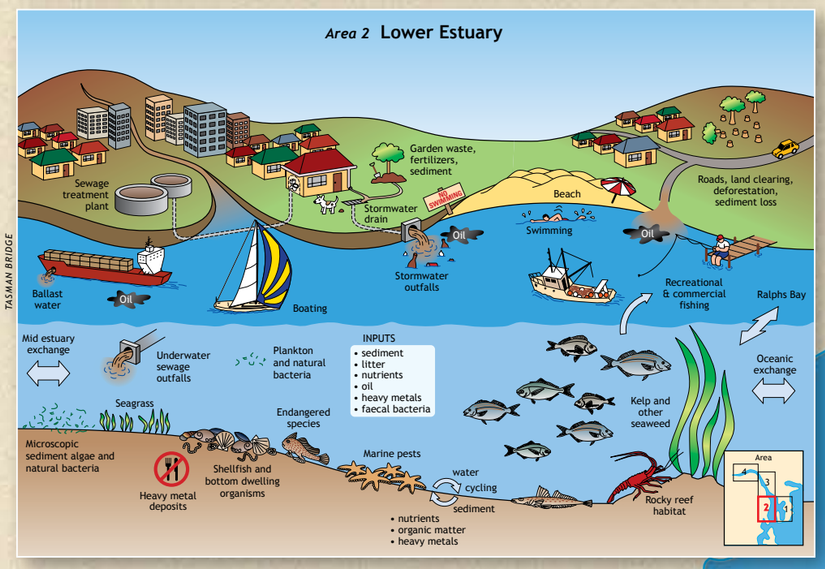
NORSKE SKOG BOYER PAPER MILL EFFLUENT TREATMENT

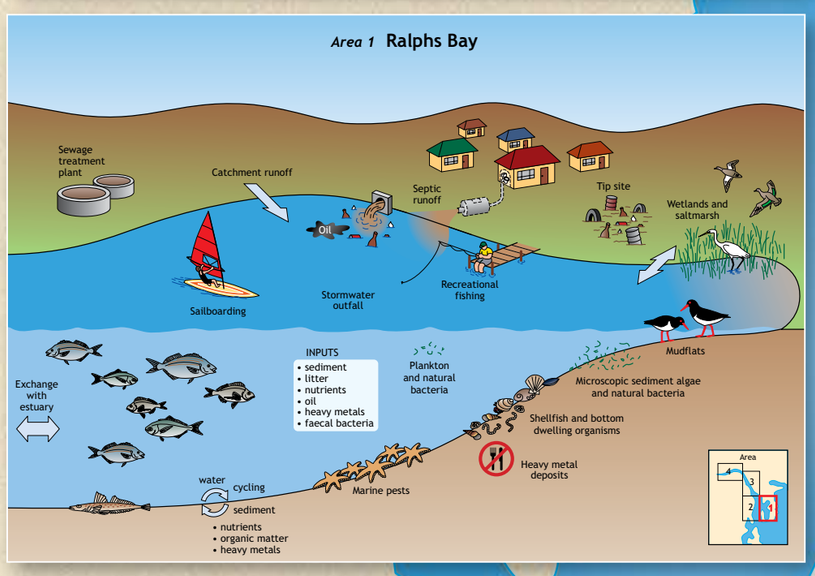
The Norske Skog Boyer paper mill secondary effluent treatment plant saw its first full year of operation in 2008. A substantial and ongoing improvement in the organic load to the Derwent River has been measured since secondary treatment began in 2007. Softwood conversion has been the main focus of the mill since installation of the new effluent treatment facilities. Completion of softwood conversion is scheduled for late 2009 and will see the elimination of eucalypt pulping and the chemi-mechanical pulping process. These key process changes are expected to result in further improvements in effluent quality from 2010.











DERWENT HABITAT ATLAS

Knowing what habitats exist on the Derwent estuary foreshore and under the water is an important first step in managing development and maintaining what remains of the estuary's natural integrity. To follow on from the assessment of the Murphys Flat wetland, a habitat atlas for the entire Derwent estuary has been compiled. The habitat atlas integrates new and previous mapping of foreshore and estuary habitats (data held by DPIPWE (Coastal Marine Branch), Tasmanian Aquaculture Fisheries Institute, Information Land Services, Seacare).The project has filled a number of information gaps, including foreshore vegetation maps along the Clarence section of the Derwent shoreline and a map of all of the upper Derwent tidal wetlands. The atlas is available through the Tasmanian State Government's LIST website and will be particularly useful for planners. This project was funded by the Australian Government's Envirofund and sponsored by the Tasmanian Conservation Trust.

LITTER TRAPS AROUND HOBART

Litter is visually and aesthetically unpleasant and is a hazard both to human health and marine life. Litter accumulation along the Derwent's foreshore has been cited as one of the community's greatest concerns. In the Derwent Estuary Program's Community Survey 2007, respondents ranked litter second in terms of greatest environmental threats to the Derwent estuary, following pollution from local industry. Stormwater is the main source of litter to the estuary and in 2009 the DEP estimated that 852 tonnes reaches the Derwent annually which equates to 852 ute loads of rubbish. Stormwater litter traps are cost effective in capturing litter including small items like cigarette butts. Hobart City Council has installed over 500 stormwater litter traps throughout its commercial areas since 2002, representing one of the largest installations of these devices in Australia. They capture approximately 136 tonnes of litter, gross pollutants and coarse sediment. Another 40 stormwater litter traps have recently been fitted in Moonah and Glenorchy CBD by Glenorchy City Council and nine traps were installed in the Rosny Transit Centre by Clarence City Council. Over 300 traps have been installed by private industry throughout the Derwent estuary region.

WATER SENSITIVE URBAN DESIGN

Water Sensitive Urban Design (WSUD) is the design of stormwater infrastructure that aims to minimise impacts of urbanisation on waterways and estuaries. WSUD incorporates elements such as permeable pavements, vegetated swales, biofiltration systems ('raingardens'), green roofs and stormwater treatment wetlands within building and subdivision design. During the past five years over 20 major WSUD systems have been installed in the Derwent region by local councils (see map). A recent example is the rain garden (small biofiltration system) installed in Lefroy St, North Hobart that captures and treats runoff from a Council owned car park 1400 m2 in size. Native plants were selected to help filter the stormwater. A 100 mm slotted drain pipe at the base of the rain garden directs the treated stormwater into the adjoining Providence Gully Rivulet from where it flows to the Derwent estuary.

FORESHORE TRACKS

In 2007 a tracks inventory was conducted to assess and map the existing tracks on the Derwent foreshore and identify where links may be developed to create a network. Of the Derwent estuary's 224 km of foreshore (extending from New Norfolk to the Iron Pot lighthouse), a total of 111 km of walking tracks and potential routes were mapped. A hand held GPS was used for mapping and photos were taken of the track conditions, standard of signage and scenic value. Observations were also made regarding: the current Australian Standard Walking Track Class, the recommended Australian Standard Track Class, tourism potential, priority for works, estimated cost for works and potential links to other tracks. The assessment will provide a good starting point for evaluating track upgrades and development of user friendly maps.

NYRSTAR HOBART SMELTER

Nyrstar Hobart Smelter have been successfully intercepting and treating contaminated groundwater flowing beneath the site for the past 12 years to prevent it discharging into the Derwent estuary. In 2008 a major new recovery system was installed to target heavy contamination below one of the processing departments. A network of 13 horizontal finger bores were drilled to passively collect contaminated groundwater and direct it to the sites Effluent Treatment Plant for heavy metal recovery. Initial monitoring of the extracted groundwater suggested that the conbined flow from the network is 24m² per day containing an average concentration of 5.8 grams per litre of zinc. This totals approximately 51 tonnes of zinc per year that would eventually be discharged into the Derwent estuary if not intercepted. Monitoring is underway and results will be reported in the 2009-10 Nyrstar Hobart Environmental Management Plan.

WATER QUALITY MONITORING SITES IN 2009

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 2009

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

INDUSTRIAL DISCHARGES IN 2009

- > 50 000 kL/d

WATER SENSITIVE URBAN DESIGN (WSUD) SITES

1. Goulds Lagoon detention basin and vegetated swales
2. Nyrstar bio-treatment system
3. Bell St bioretention basin
4. Royal Botanical Gardens of Tasmania rain garden
5. Lefroy St rain garden
6. Hobart Central Car Park media filtration system
7. Argyle St Car park media filtration system
8. Centrepoint Car Park media filtration system
9. Hungry Jacks Davey St media filtration system
10. University of Tasmania rain gardens
11. Mt St Canice Retirement Development bioretention swale
12. Kingston Wetlands
13. Kingston CBD bioretention swales
14. Kingborough Family Church car park with vegetated swale
15. Bridgewater Community Nursery vegetation filters
16. Green Point stormwater swale and pond
17. Tivoli Green Subdivision vegetated swales
18. Jetty Rd bioretention basin
19. Kangaroo Bay wetlands
20. Lauderdale wetlands

TASMAP
www.tasmap.tas.gov.au

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