State of the Derwent

Year 2001 Report Card

The Derwent Estuary

The Derwent Estuary lies at the heart of the Hobart metropolitan area and is an asset of great natural beauty and diversity. Named for 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.

Ralphs Bay

Approximately 40% of Tasmania's population - 175,000 people - live around the estuary's margins. The Derwent is widely used for recreation, boating, fishing, marine transport and industry. Further upstream, the Derwent River 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

Although there have been significant improvements in the treatment of sewage and industrial wastes over the past decade, the Derwent remains a significantly degraded estuary. 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.

In December 2001, our Environmental Management Plan was finalised and endorsed by the Premier, the Mayors of Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough Councils, and the Commonwealth. A five-year agreement was then signed to progressively implement this plan. In addition to the three levels of government, many other stakeholders participate in and support the DEP, including industries, 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 effluent reuse, stormwater management and habitat mapping and restoration.

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 formed the basis of the Derwent Estuary Monitoring Agreement, signed in August 2000 by the state government, six local councils and three industrial/commercial partners (Norske Skog Paper Mills, Pasminco Hobart Smelter and Hobart Water). The signatories agreed to coordinate their independent monitoring programs to provide better information on the estuary as a whole, and to report annually on environmental conditions and trends in the Derwent.

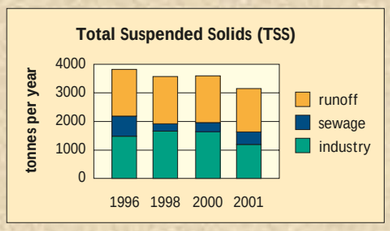
Water sampling at Cornelian Bay

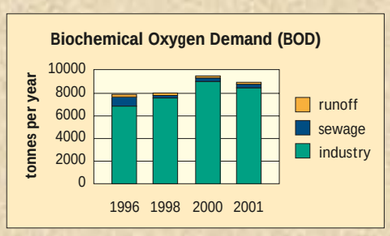
This document represents our second annual 'report card' to the community and summarises monitoring data and other relevant information collected during the year 2001. For more detailed information, the full technical report can be accessed at www.derwentriver.tas.gov.au.

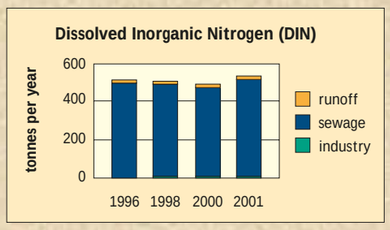
Monitoring activities carried out during 2001 included the following:

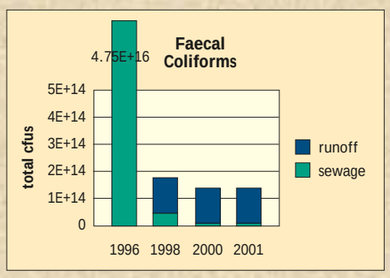
- weekly recreational water quality testing during summer months;
- quarterly water quality monitoring for a wider range of indicators;
- annual survey of mercury in flathead and heavy metals in shellfish;
- baseline survey of polychlorinated biphenyls and organo-chlorine pesticides in fish and shellfish.

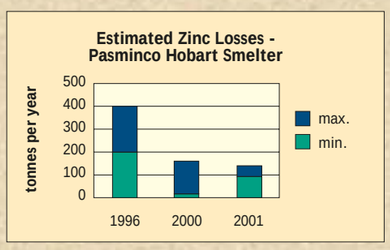
Pollution Sources, Loads and Trends 2001











Pollution enters the Derwent Estuary from a number of sources that are commonly referred to as point sources or diffuse sources.

During 2001, point sources included 10 sewage treatment plants and two large industries (Norske Skog paper mill and Pasminco Hobart zinc smelter). Diffuse sources included: urban runoff, tips and contaminated sites, catchment inputs carried by the Derwent and Jordan Rivers, air pollution and wastes associated with shipping, ports and marinas. Some pollutants are also derived from contaminated sediments within the estuary itself.

Contaminants associated with 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.

A review of the various sources and loads discharged to the Derwent indicates that, during 2001:

- Sewage treatment plants discharged the majority of nutrients
- Stormwater accounted for the majority of faecal bacteria
- Pasminco discharged the majority of heavy metals (primarily as groundwater emissions)
- Norske Skog discharged the majority of organic matter and resin acids.

There were some significant changes in pollutant loads entering the Derwent in 2001 as compared with 2000:

- A further decrease in heavy metal loads from the Pasminco site;
- Decreased loads of total suspended solids (38%), resin acids (22%) and biochemical oxygen demand (5%), and reduced effluent toxicity from the Norske Skog paper mill;
- Increased nutrient loads (10 to 20%) from some sewage treatment plants.

Longer-term trends – since 1996 – indicate a sharp decrease in faecal bacterial loads (>90%) and heavy metal loads (>50%), a decrease in TSS loads (17%), and an increase in nutrients (8% DIN, 17% TP) and BOD (15%).

Some significant management actions were initiated or completed in 2001 that are anticipated to have beneficial outcomes:

- Installation of an innovative horizontal extraction well at Pasminco;
- Process changes at Norske Skog to reduce particulate loads and their associated contaminants and reduce effluent toxicity;
- Completion of stormwater treatment wetlands at Kingston;
- New stormwater projects in Hobart and Clarence
- Catchment and Rivercare projects along the Jordan River.

Environmental Flows

The Derwent is the largest river in the region, with a mean annual flow of 90 cubic metres/second. The river is heavily used for hydropower generation, public and industrial water supplies, fish farms and irrigation. Since the 1920s, about 30% of the river's original flows have been lost.

Freshwater flows from the Derwent also play an essential role in the condition of the estuary, driving the overall circulation, providing flushing flows, determining the location and type of habitat and the timing and extent of migratory fish runs. The Derwent Estuary Program has identified the management of freshwater flows and physical barriers to fish migration as important issues in the region.

During 2001, work commenced on an assessment of environmental flows for the lower Derwent River (Davies et al, 2002). Several weirs were also removed from Jordan River and Browns River to improve fish passage (Inland Fisheries Commission).

Derwent Water and Sediment Quality 2001

Is it safe to swim in the Derwent?

Each summer, recreational water quality is measured weekly at about 30 sites around the Derwent (see map on flip side for specific locations). Two bacterial indicators are used, as recommended by national guidelines: thermotolerant coliforms and enterococci. Enterococci is generally considered to be the preferred indicator in coastal waters.

Results over the last 13 years have shown progressive improvements in water quality as sewage treatment plants have been upgraded, particularly in the middle and upper parts of the estuary. The Jordan River and Browns River have also improved in recent years. During the past 3 years, most sites have met recreational water quality guidelines for primary contact – particularly the main recreational beaches to the south of the Tasman Bridge.

Swimming at Sandy Bay Beach

Faecal bacteria levels during the 2001-2002 monitoring season were higher than the previous year, particularly during the rainy months of November and December. Bacterial levels decreased at most sites thereafter, with the onset of drier conditions. Consistently high levels were measured at the Regatta Pavilion site, resulting in the cancellation of the 2002 Cross-Derwent Swim. Follow-up investigations identified high bacterial levels in the nearby Hobart Rivulet and a sewer leak was later found and repaired.

Are other indicators of water quality improving or declining?

Long-term data sets for *heavy metals* suggest significant decreases in water column concentrations of zinc, cadmium and other metals over the past thirty years, but zinc levels at mid-estuary sites are still above recommended ecological guidelines. New Town Bay has shown significant reductions in water column zinc levels since the Loogana/Inshallah cut-off wall was installed in 1997.

Dissolved oxygen levels in the upper estuary have improved since the pulp mill at Boyer implemented primary treatment in 1990, but oxygen levels are still low at depth during summer months and low flow conditions. This is due in part to a natural tendency towards oxygen depletion in the upper reaches of stratified estuaries, combined with the effects of the pulp mill effluent.

Nutrient and chlorophyll a data is more difficult to interpret due to a shorter record and high natural variability. Nutrients vary seasonally, with highest values measured in winter months when nutrient-rich, sub-antarctic waters extend to southeastern Tasmania. Levels are generally highest at mid-estuary sites, in bays and at depth, reflecting inputs from sewage treatment plants and sediments. Chlorophyll a levels are usually moderate to low. No clear trend is evident over the past 5 years, except in Prince of Wales Bay, where nutrient and chlorophyll levels have doubled.

Is the area of contaminated sediments increasing or decreasing?

A detailed sediment quality survey (123 samples) was completed for the Derwent Estuary in 2000. Data on heavy metal levels and organic matter content was presented in 2000; grain size and calcium carbonate data became available in 2001.

Sediment sampling

The majority of sediments within the Derwent are fine-grained and organic-rich and do not meet sediment quality guidelines for a number of heavy metals, particularly for mercury (99% of area in excess of guidelines), lead (87% in excess), zinc (68%) and cadmium (64%). Recurrent sediment surveys conducted in New Town Bay also indicate high levels of cadmium, mercury and zinc.

Restoration of contaminated sediments is technically challenging and very costly. Further information is needed on sediment toxicity, sediment-water fluxes of heavy metals and current sedimentation rates before the effectiveness of potential remediation options can be evaluated.

Changes in Derwent Marine Habitats Since European Settlement

Recent studies by scientists at the University of Tasmania suggest that there has been a dramatic change in Derwent Estuary benthic communities over the past 200 years. Analysis of ten cores collected from the middle and lower estuary shows a progressive shift in mollusc species and a decline in numbers. For, example, the cores document that scallops were formerly present in Cornelian and New Town bays. The cores also indicate that sediments have become progressively finer-grained and contaminant levels have increased dramatically. The causes for these changes are likely to be multiple, and may include run-off and sedimentation from land clearing, changes in river and sediment flows associated with dam construction, introduction of exotic species, heavy metal and organic pollution, overfishing and habitat alteration from dredges and trawls. (Sampson, 2002)

Derwent Habitat and Species 2001

Are contaminant levels in seafood increasing or decreasing?

Pasminco Hobart Smelter has monitored mercury levels in Derwent Estuary flathead for 20 years. The long-term trend has shown a progressive reduction in mercury levels, however levels in 2001 were slightly higher than the previous year. Mercury levels in flathead are currently below the current National Food Guidelines.

G. Edgar

Flathead

Heavy metals in Derwent Estuary shellfish have been monitored by Pasminco for 11 years. Levels are well above the national guidelines – particularly for zinc in oysters and lead in mussels – with highest values in the area above the Tasman Bridge, followed by Ralphs Bay and then the Eastern Shore. There are no apparent long-term trends. Heavy metals in shellfish appear to have increased slightly in 2001 as compared to 2000.

In 2001, an analysis of polychlorinated biphenyls (PCBs) and organichlorine pesticides (OCPs) was carried out on fish (flathead, bream, trout, mullet) and shellfish (oysters, mussels) samples from the Derwent. Twenty-one composite samples were analysed for for nine toxic organic compounds: all results were below detectable limits (<0.10 ppm).

Is fish and wildlife habitat increasing or declining?

A detailed subtidal habitat survey completed in 1999/2000 (TAFI, 2000) showed that most of the Derwent seafloor is characterised by unvegetated, soft sediments (96%). There are however, important marcophyte beds (underwater grasses) in the upper estuary, rocky reef habitats in the lower estuary, and some scattered seagrass beds in the middle and lower estuary.

Norske Skog's ERA studies (2000) further confirmed the importance of macrophytes and wetlands to the upper Derwent ecosystem. These studies also included detailed surveys of benthic macroinvertebrates (animals that live in the sediment) and a detailed survey of fish populations. Both communities show indications of improved health over the past decade.

The Derwent's spotted handfish has the dubious distinction of being Australia's only critically endangered marine fish. This small, slow-moving fish was formerly common, but is now restricted to three colonies in the lower estuary. Studies by CSIRO suggest that the decline is associated with the loss of spawning substrate (structures suitable for the female fish to attach the egg mass), which in turn may be linked to an increase in northern Pacific seastar numbers. A Recovery Plan has recently been completed and aspects are being implemented. In the short-term this involves the provision of artificial spawning structures as an emergency measure.

CSIRO

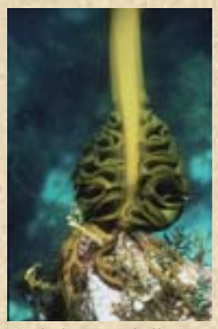
Spotted handfish with egg mass

Are marine pests increasing or decreasing?

Introduced marine pests pose a serious threat to the overall ecology and native species of the Derwent Estuary. Over 20 introduced marine species have been identified in the Derwent Estuary and there are probably many more unrecorded species. Many of these species appear to flourish in the Derwent, taking advantage of the disturbed or altered environment. The northern Pacific seastar (*Asterias amurensis*), Japanese seaweed (*Undaria pinnatifida*) and toxic dinoflagellate (*Gymnodinium catenatum*) are of greatest concern.

Northern Pacific seastar populations are extremely high (estimated 3 million), and have apparently played a major role in the reduction in shellfish abundance in the estuary - particularly bivalves that live in soft sediment habitats.

Japanese seaweed is well-established in the Tinderbox Marine Reserve, but does not appear to have spread further north into the Derwent at the present time.



CRIMP/CSIRO

Undaria sporophyll

Toxic dinoflagellates bloom periodically in the Derwent (and the Huon) and are sometimes called 'red tides'. These single-celled organisms accumulate in shellfish - if eaten by humans - can cause Paralytic Shellfish Poisoning, a potentially fatal condition.

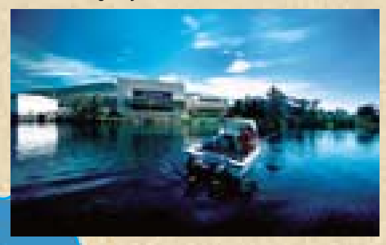
Rice grass has been reduced to very small areas (<1 square metre) and is regularly surveyed and treated.

FOR MORE INFORMATION PLEASE CONTACT
Christine Coughanowr,
Derwent Estuary Program Manager
Telephone: 6233 6547
Email: christine.coughanowr@dpiwe.tas.gov.au
Website: www.derwentriver.tas.gov.au

Ecological Risk Assessment – Norske Skog Paper

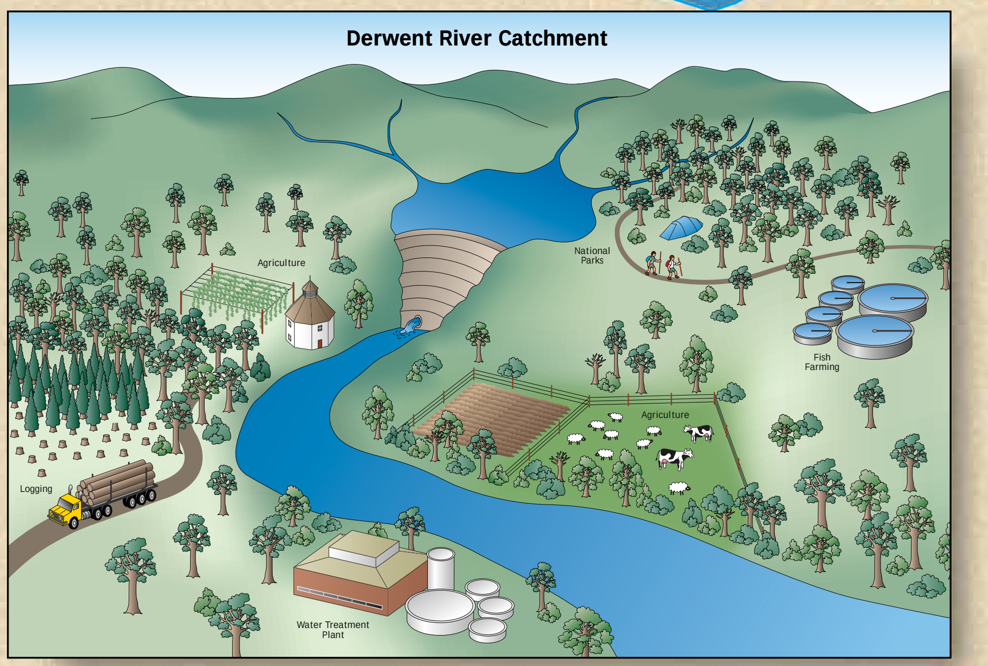
During 2001, an Ecological Risk Assessment (ERA) was completed by Norske Skog regarding the impacts of the paper mill's effluent on the estuary between New Norfolk and Bridgewater. Major findings included the critical role played by wetlands in the upper estuary in cycling nutrients, the significant impact of natural carbon inputs on dissolved oxygen in the bottom saline waters of the upper estuary, and the role of colour in plant growth. The EMPC Board accepted the study's findings that the mill effluent represents a low risk of causing environmental harm outside the mixing zone of the effluent. As a result of this study, the State has extended the timeframe for implementation of accepted modern technology (to reduce organic loads) until 2006. The mill has also implemented a number of process changes that have reduced total suspended solids and resin acid loads by 35% and 23%, respectively. The models developed for the ERA have formed the basis for other studies on the upper estuary and have recently been used to assess potential ecological risks associated with further extractions of freshwater for irrigation in southeastern Tasmania.

Norske Skog Boyer Mill



Jordan River Integrated Catchment Management Plan

The Brighton and Southern Midlands Councils have recently completed a Catchment Management Plan for the Jordan River from its source at Lake Tiberius to its confluence with the Derwent Estuary. The process included collection of data on physical conditions and habitat (assisted by DPIWE) and input from a Community Catchment Committee. Major issues identified in the plan include poor water quality, altered river flows and riparian weeds, particularly willows. Objectives include monitoring, education and improved management of the river and its catchment, with a long-term goal of a healthy and free-flowing river to be enjoyed by the rural and urban communities through which it flows. A Rivercare Plan has subsequently been developed and is being implemented. Some 10 km of the river have been repaired by removal of willows, stream clearance and rehabilitation programs, with a noticeable improvement in waterway condition. This project has been supported is part through a Natural Heritage Trust grant.



Murphys Flat wetlands

Derwent Estuary Wetlands Acquired

The marshes of the upper Derwent support important populations of birds, fish, and platypus and also act as a natural filter, removing sediments, nutrients and other pollutants from the water. Although nominally associated with the Derwent River Conservation Area and listed as Wetlands of National Importance, many of these upper estuary marshes are not effectively managed or protected. In 1999, a 66 hectare marsh (Murphys Flat) was burned off and trenched with the intention of converting it to agricultural uses. An application to acquire this wetland was successfully filed under the Natural Heritage Trust's National Reserve System Program, and in 2001 the wetland was added to the existing reserve system. Matching funding was provided by the State Government, Derwent Valley Council and Norske Skog. These wetlands will increase the wetland area under protection by about 30%.

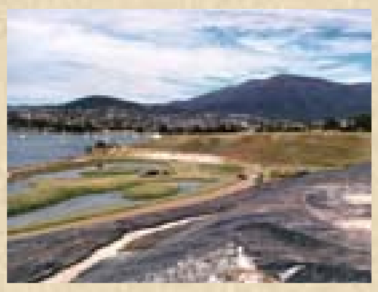
Rice Grass Eradication – Marine Resources/DPIWE

Rice grass (*Spartina anglica*) is an introduced salt marsh plant that has invaded the upper intertidal zone of a number of Tasmanian estuaries, including the Tamar, Derwent, Rubicon, Little Swanport, Bridport, St Helens, and the Smithton/Stanley area. This plant is a serious nuisance, resulting in enhanced sediment deposition, loss of biodiversity and recreational impacts. Rice grass has been found in the Derwent at a number of locations between Bridgewater and Lindisfarne Bay, but after several years of intensive effort, is now restricted to a few small stands in the area between Elwick Bay and Dogshear Point. Two surveys per year are currently being carried out by Marine Resources (DPIWE) to locate and eradicate these remaining stands.

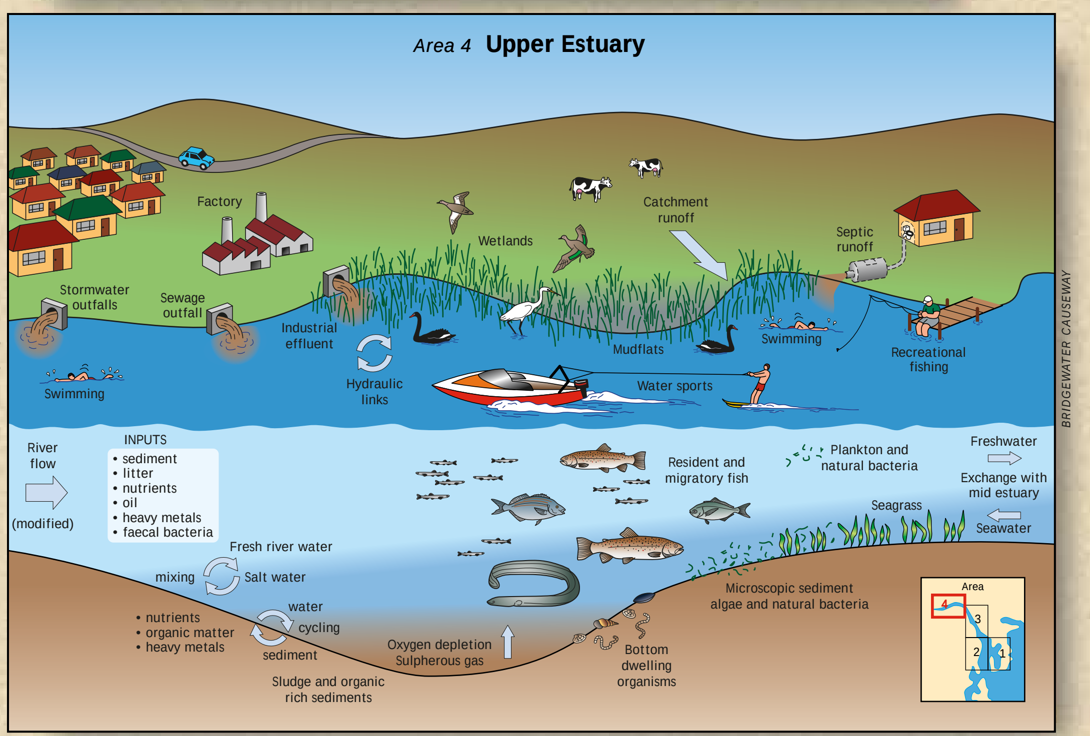
Rice Grass

Groundwater Clean-up Continues – Pasminco Hobart Smelter

In recent years, a major source of continuing heavy metal discharges to the Derwent has been historic groundwater contamination beneath the Pasminco smelter site at Risdon. In 2001, the company completed a major landfill remediation project at the site, resulting in significant reductions in pollutant loads. During 2001, three alternative groundwater collection techniques were trialled: an 80 m interception trench, a standard extraction well and an innovative horizontal extraction well. The horizontal well – funded in part through a Natural Heritage Trust grant – has been particularly successful. Directional drilling techniques were used to install a 120 m horizontal well that connects fractures in the underlying bedrock at a depth of 15 meters. The well is situated beneath the operating plant, just above the shoreline. Pumping from the well commenced in November 2001, with the contaminated ground water being treated at the site's effluent treatment plant. During the first six months of operation, the well has recovered 200 kg zinc per day, plus other associated contaminants. This project was awarded the major Tasmanian Award for Environmental Excellence in 2002.



Pasminco landfill rehabilitation



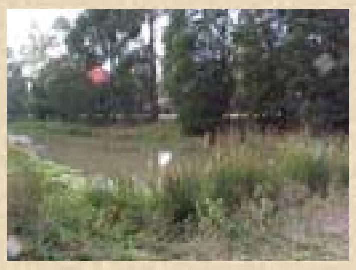
Hobart Docks and Salamanca Stormwater Improvement – Hobart City Council

Since March 2001, 83,000 items (2.5 tonnes) of litter have been collected from 63 stormwater litter traps in the Salamanca and Hobart Docks area. Three different at-source stormwater litter traps are being assessed and a report will be produced the end of the trial on their relative performance. Based on this assessment, additional at-source pollutant traps will be installed in the area. The trial is one of the most comprehensive assessments of litter in Australia with 21 identifiable categories. 40,000 items or 48% of all litter collected from the traps were cigarette butts. An education campaign targeting cigarette butt litter has been developed, including the promotion and distribution of portable ashtrays – 'mini butt bins' - in an effort to reduce cigarette butt litter. This project was funded in part through Coasts & Clean Seas, a program of the Commonwealth's Natural Heritage Trust.

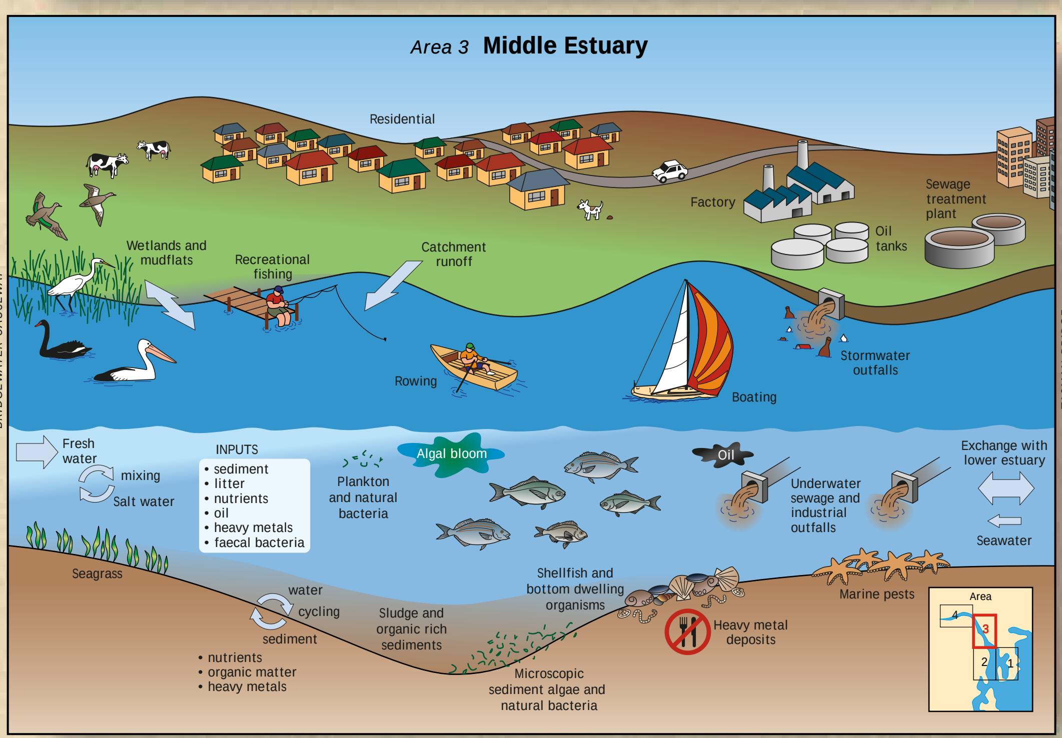
Hobart litter trap

Kangaroo Bay Rivulet Project - Clarence City Council

In 2001, Clarence City Council commenced works on Kangaroo Bay Rivulet to construct a 5.5 megalitre pond/wetland system to collect, treat and reuse stormwater. The initial stages of the project included construction of a weir across the rivulet, stabilisation of exposed surfaces with non-invasive grass species and provision of stormwater to irrigate the neighbouring Rosny Golf Course. Stage 2 of the project, partly funded by Coasts & Clean Seas, will involve establishment of native wetland vegetation, community stormwater education, water quality monitoring, and installation of 2 gross pollutant traps.



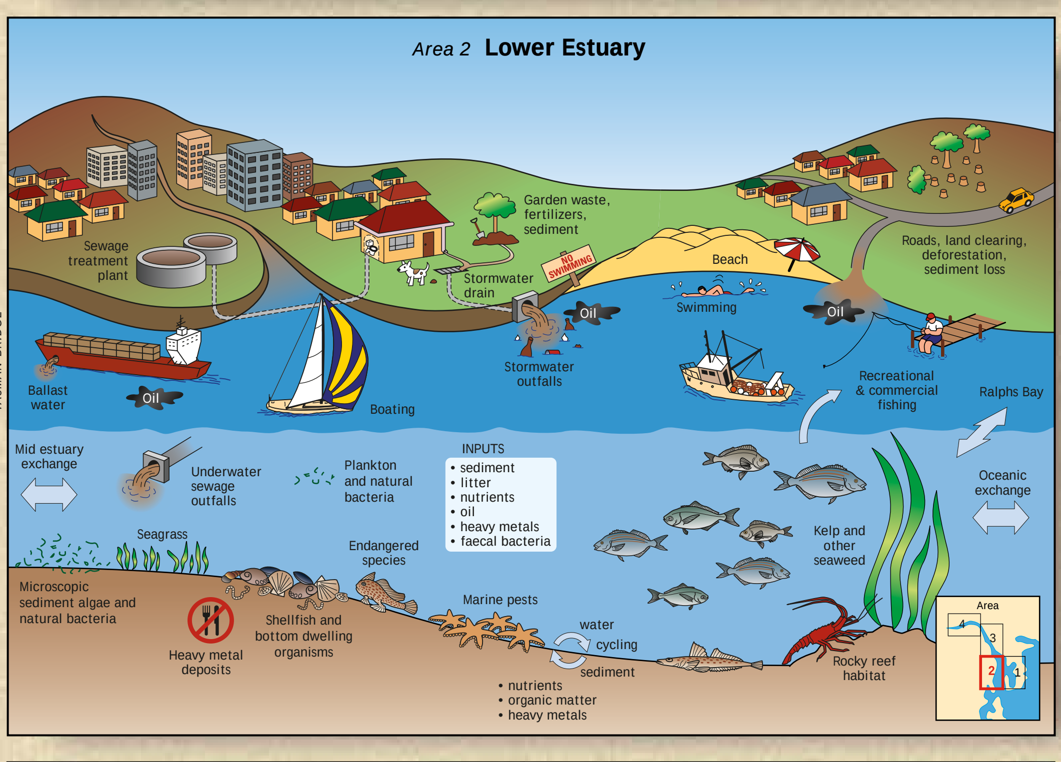
Kangaroo Rivulet

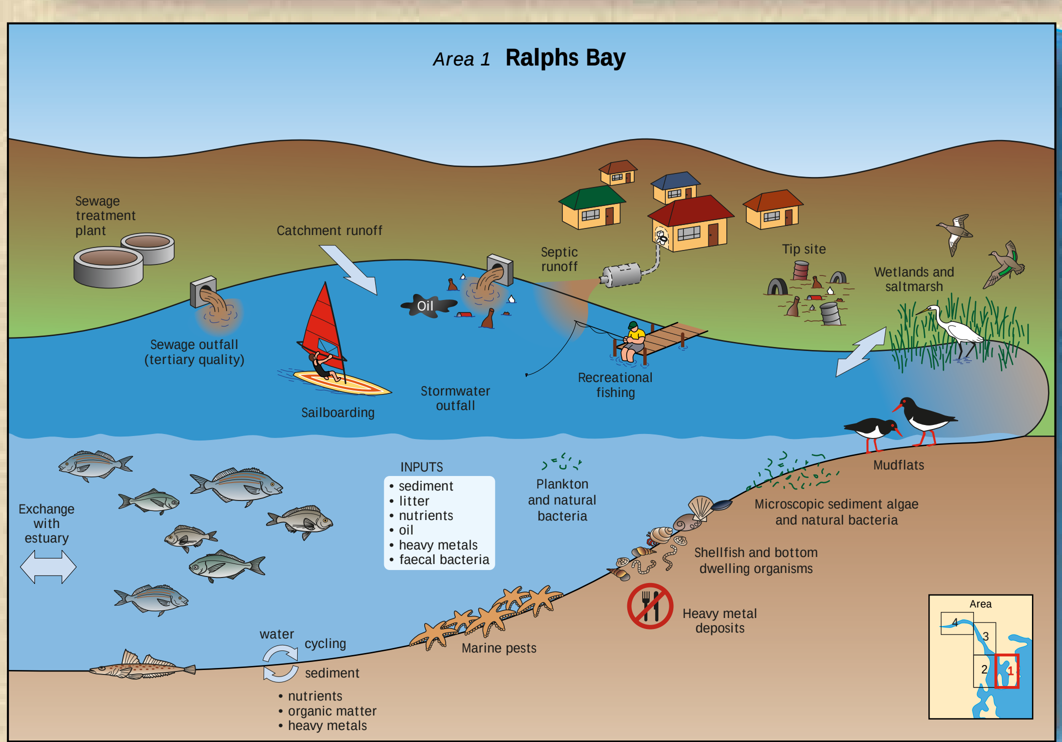


Kingston Stormwater Wetlands – Kingborough Council

The Kingston pollution abatement ponds and wetland system was completed in January 2001 and has been functioning well, despite an unusually wet spring. The system consists of a series of 4 linked ponds and fringing wetland, and treats flows from Whitewater Creek and Kingston Rivulet before the water enters Browns River. Water quality monitoring indicates significant reductions in levels of faecal bacteria, litter, silt and nutrients as the water passes through the system. The construction of the wetlands has also fulfilled Council's long term goal of developing the site as a recreational area for residents. The area has been landscaped with about 15,000 native plants (both land and water species) and includes walkways, picnic tables and interpretive signage. This project was funded in part through Riverworks Tasmania, a program of the Commonwealth's Natural Heritage Trust.

Kingston wetlands





CLARENCE CITY
GLENORCHY CITY
DERWENT VALLEY COUNCIL
BRIGHTON COUNCIL
HOBART CITY COUNCIL
KINGBOROUGH COUNCIL
Hobart Water
Norske Skog Boyer
Natural Heritage Trust
Helping Communities Helping Australia
A Commonwealth Government Initiative
PASMINCO HOBART SMELTER
Tasmania