STATE OF THE DERWENT

Year **2012** 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.

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, e.g. erosion, flooding and habitat loss

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.

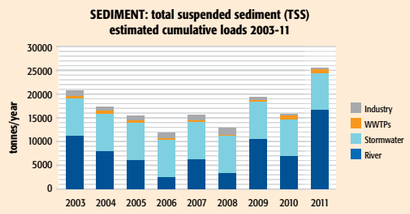
This 'Report Card' summarises monitoring data collected by the DEP and our partners, as well as other relevant information collected during 2011-12, including:

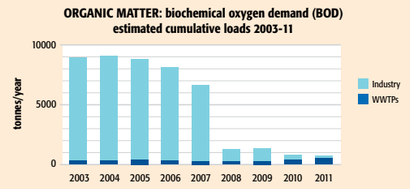
- weekly recreational water quality testing during summer months;
- monthly whole-of-estuary water quality monitoring;
- surveys of heavy metal levels in fish and shellfish;
- biological surveys (little penguins, spotted handfish) ; and
- weed surveys and control actions (rice grass, karamu).

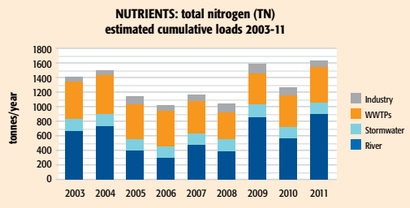
More detailed information is published in five-yearly State of the Derwent Estuary reports, available on our website: **www.derwentestuary.org.au**

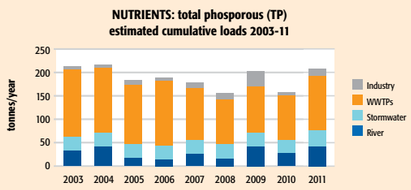
INTERNATIONAL RIVERFOUNDATION RIVERPRIZE 2010 NATIONAL RIVERPRIZE WINNER

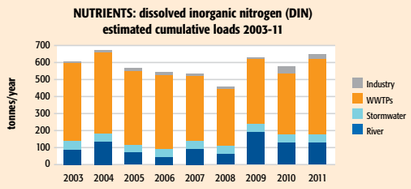
POLLUTION SOURCES, LOADS AND TRENDS

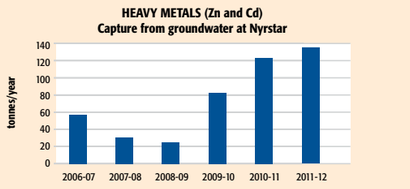












Pollution enters the Derwent estuary from many sources, commonly referred to as 'point sources' and 'diffuse sources'. Point sources include sewage treatment plants and large industries, such as the Norske Skog paper mill at Boyer and Nyrstar Hobart zinc smelter at Lutana.

Diffuse sources include stormwater runoff from urban areas and the larger catchment inputs carried by the Derwent and Jordan rivers. Other diffuse pollutant 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 re the largest point sources of nutrients to the estuary. Since 2007, discharge volumes of treated sewage effluent have increased (17%), probably as a result of higher stormwater inflows and reduced effluent reuse. Effluent reuse varies from year to year but declined to 8% in 2011 due to elevated rainfall resulting in reduced demand. A new effluent storage dam should improve reuse uptake in future.

Industries have historically been 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%. At the Nyrstar Hobart smelter, projects to collect and treat contaminated groundwater and stormwater (which previously entered the Derwent) captured a record 131 tonnes of zinc and other heavy metals in 2011.

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 a major 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. To better understand current conditions and trends, in 2011/12 a detailed review of Derwent catchment water quality data was carried out (see below). In 2012/13 a State of the D'Entrecasteaux Channel review will be completed.

DERWENT CATCHMENT REVIEW

The catchment of the River Derwent is one of the largest in the state (8900km^2) and is used for a wide range of activities. It is essential to maintain good water quality and flows at the base of the catchment, as the river provides 60% of Hobart's drinking water and plays a major role in water quality and ecosystem health of the estuary.

In 2011, the DEP and NRM South co-funded a review of River Derwent water quality and flows, with support from Hydro Tasmania, DPIPWE, Southern Water and Derwent Catchment NRM. The goal of the study was to compile and analyse recent data sets, identify trends and existing/potential water quality risks. The review found that while extensive monitoring has been carried out, programs are spatially and temporally fragmented, making it difficult to evaluate trends for the catchment as a whole. A key recommendation is that a long-term , whole-of-catchment monitoring program be implemented that involves multiple stakeholders. Current stressors and potential risks tend to be exacerbated by floods and droughts and include run-off from agriculture, forestry and recreational areas, changes in flows or water quality due to hydropower, irrigation and fish hatcheries, and risks associated with blue-green algae and climate change. The full report can be viewed at **www.derwentestuary.org.au**.

DERWENT WATER AND SEDIMENT QUALITY

CLIMATE IN 2011/12

Hobart rainfall in 2011 was 20% higher than average, resulting in higher river and stormwater flows, and consequently, higher loads of faecal bacteria, sediments, nutrients and litter.

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.

Seven of the Derwent's 18 swimming sites are classified as having good water quality, nine are fair and two are poor. The best water quality was measured at New Norfolk Esplanade, Little Sandy Bay, Hinsby Beach, Blackmans Bay and Opossum Bay. Windermere Beach and the western end of Nutgrove Beach received poor water quality ratings.
Of the 19 bays, coves and other sites monitored, five have good water quality, five are fair and nine are poor (in particular at Hobart Rivulet, Cornelian Bay, Marieville Esplanade, Lindisfarne Bay, Geilston Bay and Browns River).
Water quality declined at a number of Derwent beaches and bays in 2011/12, due in part to run-off during storm events. It is recommended that investigations be carried out to identify and address pollution sources at beaches with poor water quality and at some bays.

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 monitored each month at 27 sites for indicators such as temperature, salinity, dissolved oxygen, suspended solids, nutrients, organic carbon, chlorophyll a and heavy metals. This information is used to document conditions and trends over time and to provide data for estuarine modelling and process studies.

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 can also result in the release of nutrients and heavy metals from underlying sediments.

Although *nutrient enrichment and nuisance algal blooms* have not been a major concern in the Derwent to date, there are some indications that this may be changing. These include increasing periods of low oxygen levels at depth in the upper estuary, higher levels of bioavailable nutrients in the water column, and reports of increasing macroalgae in some bays. Further monitoring and investigations of nutrient sources are recommended to better understand and prevent adverse impacts.

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. During 2011 surface sediment samples were collected at 130 sites across the estuary. Results are being analysed and will be presented in the next report card.

THE ROLE OF SEDIMENTS IN NUTRIENT CYCLING

2011 saw the completion of a multi-year ARC-Linkage investigation into the role of Derwent sediments in nitrogen and carbon cycling, coordinated by the University of Tasmania and supported by the DEP and Norske Skog Boyer. The study coincided with a major reduction in organic loading from the paper mill at Boyer – an opportunity to assess system response to a major 'step change' in inputs.

The study included in situ surveys of nutrient fluxes from sediments at 16 sites, 'before and after' studies around the Norske Skog treatment upgrade and manipulative experiments in the lab to better understand how dissolved oxygen and other factors influence sediment processes. Key findings include the following:

- Dissolved oxygen levels, organic matter loading and river flows are key drivers of sediment nutrient cycling, with effects most visible in the upper estuary;
- The secondary treatment upgrade at Norske Skog resulted in a major reduction in carbon loading, with benefits to the system as a whole, but with localised effects associated with the more bioavailable nature of the effluent. These effects are being managed by further reducing TSS levels in the effluent.
- While the majority of heavy metals in Derwent sediments are relatively inert, short periods of oxygen depletion can result in significant releases of some metals
- Shallow seagrass beds and intertidal flats are likely to play a critical role in nutrient processing in the Derwent, and are an important area for further work.

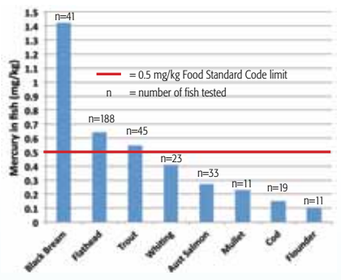
The full summary report can be viewed at **www.derwentestuary.org.au**.

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 exceed national food standards in several species of Derwent-caught fish – particularly black bream – and to a lesser degree flathead and trout. Limited sampling suggests that levels are lower in other recreationally-targeted fish (e.g. whiting, Australian salmon, mullet, cod and flounder).



The latest results are available in the DEP's 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, women planning to become pregnant and young children***

ESTUARINE HABITAT & SPECIES

Recent surveys of estuarine 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 (1%; primarily in the lower estuary).

Surveys of four Derwent estuary spotted handfish colonies were completed in 2011, documenting a total of 102 fish. Unfortunately very few of these were juveniles, suggesting poor breeding success. Over 1500 artificial spawning substrates were installed at key sites to improve breeding success. An unexpected finding of the surveys was that densities of northern Pacific seastars appear to have declined sharply at all sites.

Monitoring of Derwent little penguin colonies found a substantial increase in numbers of breeding pairs in 2011, as compared to the low numbers in the previous year. Councils, community groups and DEP staff have continued to enhance key sites through revegetation, fencing and signage, and installation of artificial burrows. Unfortunately 25 birds were killed in a dog attack in 2012. Further efforts are needed to protect suburban penguin colonies from domestic animals, both dogs and cats.

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 had been reduced from two hectares in 1995 to zero in 2009 and 2010. However the 2011 survey found three small patches in the middle estuary region. These have been treated, and will continue to be monitored as part of future surveys.

During 2011, the DEP also continued to survey and treat a major infestation of karamu – a recently introduced woody weed from New Zealand. Karamu.is a serious threat to the upper Derwent wetlands, and has already spread 5 km down-river from New Norfolk. A containment line has now been established near Boyer and 125 outlier plants were mapped and treated downstream. In addition, a portion of the main infestation was successfully tackled.

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.

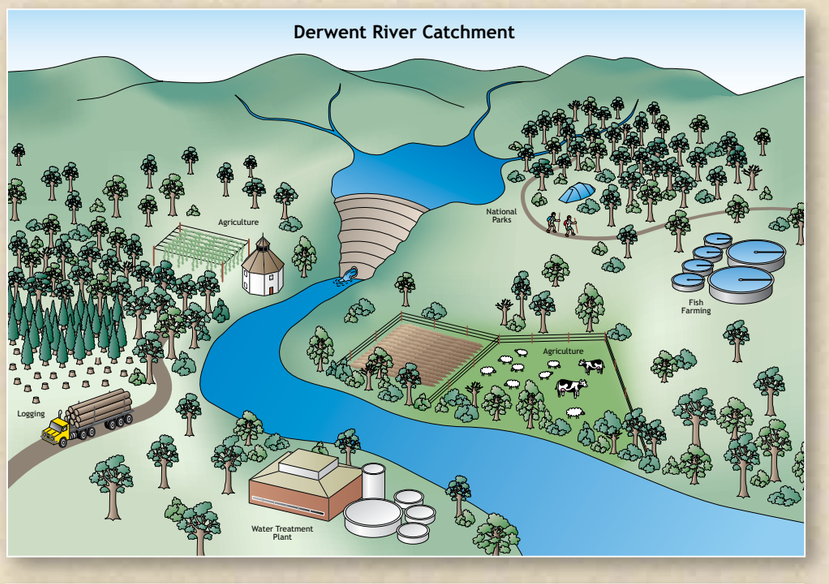
RECENT MANAGEMENT ACTIONS, SAMPLING SITES AND DISCHARGE POINTS

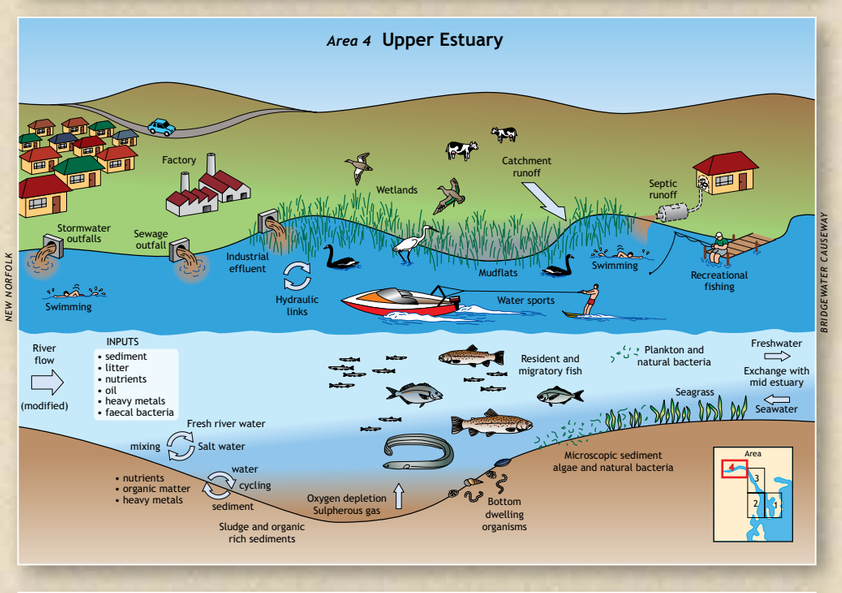
Program partners:

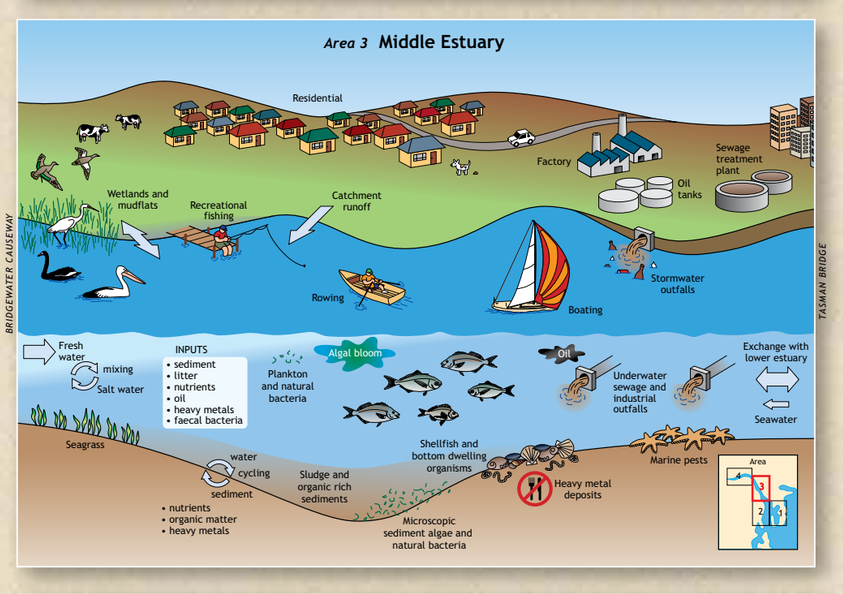
Clarence... a brighter place · Glenorchy City Where ideas happen. · Derwent Valley Council · Brighton Council · Hobart City Council · Kingborough · southern water · TasPorts · Hydro Tasmania The power of natural thinking · Norske Skog Boyer · nyrstar · Caring for our Country · Tasmanian Government

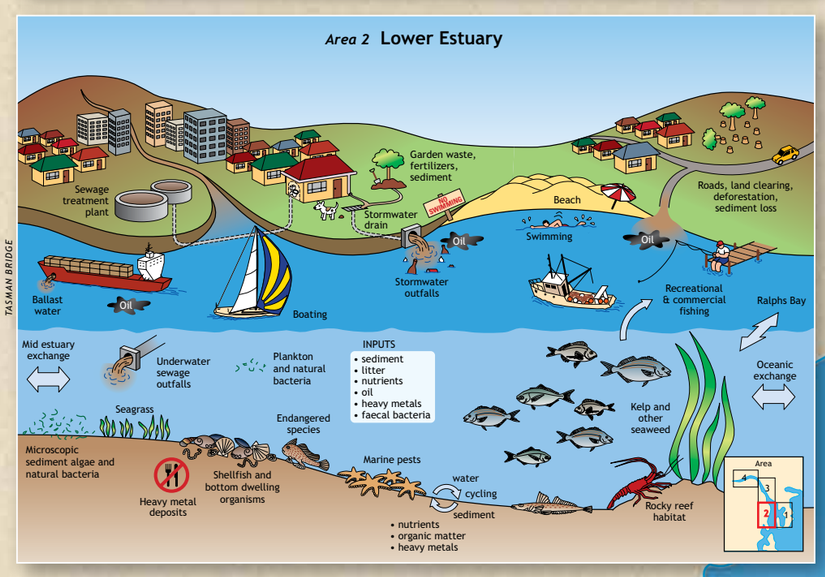
TIDAL WETLANDS AND SEA-LEVEL RISE

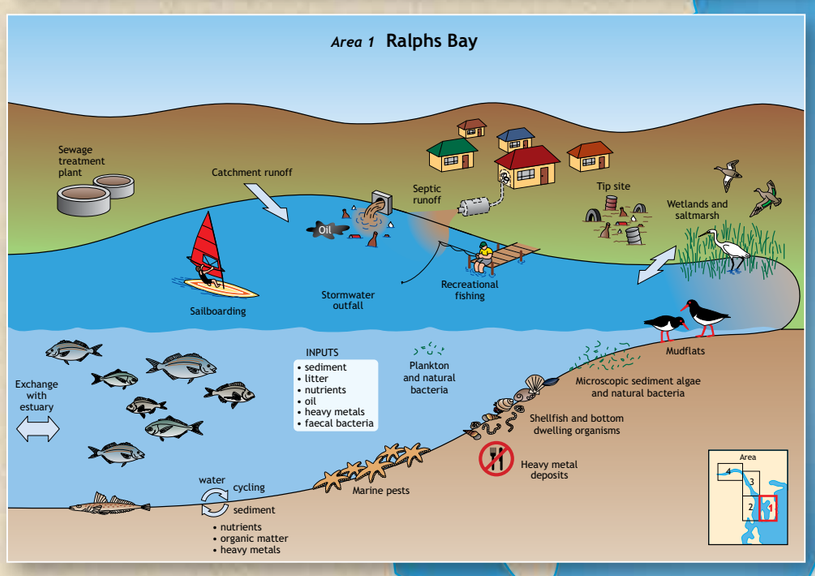
Tidal wetlands and salt marshes play an important role in stabilising shorelines, filtering pollutants and providing habitat for birds, fish and other biota. Many of the original wetlands around the Derwent have been lost to landfill and those that remain are highly vulnerable to sea-level rise, particularly where they are unable to migrate landward. Recent surveys have documented a total area of 3.4 km2 of tidal wetlands and saltmarshes, primarily in the upper estuary and at Lauderdale. The impacts of projected sea-level rise on these habitats have recently been studied, by integrating high-resolution topographic surveys (LiDAR) with sea-level rise projections for 2100. Results suggest that many of the Derwent's tidal wetlands and saltmarshes are at risk of being squeezed out, and need to be considered within coastal planning and development. The full report can be accessed on the DEP website at **www.derwentestuary.org.au/scientific-and-technical-reports/**.











STORMWATER HARVESTING AT DERWENT PARK

The $20 million Derwent Park reuse project has been funded as a joint initiative of the Glenorchy City Council and the Australian Government *Water for the Future Initiative* through the *National Urban Water and Desalination Plan.* The project will capture and treat stormwater from the heavily urbanised Derwent Park catchment, after which it will be sold on to Nyrstar Hobart smelter to replace some of the potable water currently used for industrial processes. Some of the recycled water will also be used to irrigate local sports grounds and parks. In addition to the estimated 80 tonnes of stormwater pollutants removed by this system each year, the project will also alleviate local flooding of roads, businesses and households.

HELPING THE SPOTTED HANDFISH

The endangered spotted handfish – found only in Derwent estuary – has been given a boost through the efforts of the DEP, CSIRO, IMAS, Reef Life Survey, Veolia Environmental Services, and Aquenal, with funding support from the Australian Government. Recent surveys indicate that spotted handfish numbers remain critically low, with only a handful of remaining colonies. Low numbers of juvenile fish suggest poor breeding success. During the spring and summer of 2011 -12, over 1500 artificial substrates (plastic rods) were installed by divers at key sites. Resurvey of the plastic rods during spawning showed that some were being used for egg attachment, providing evidence that this is an effective recovery action. Heinz Australia featured the spotted handfish as one of 4 iconic species in their 2012 Clean Seas Campaign and have donated nearly $23,000 to support further monitoring and recovery actions.

FORESHORE TRACKS – GET WALKING!

There are currently over 100 km of foreshore walking tracks along the Derwent estuary between New Norfolk and South Arm. Some tracks have been in existence for years, while others have recently been upgraded or extended by Councils. The Derwent Estuary Program (DEP) recently produced a brochure highlighting 26 walking opportunities along the estuary, with support from a Tasmanian Sport and Recreation grant. Follow the tracks to visit Hobart's waterfront, explore wetlands, bushland, sea cliffs, beaches, parks and stunning views and keep an eye on the estuary for dolphins, seals, penguins and the occasional whale. The tracks offer something for everyone and many can be enjoyed by the whole family including the dog! Many tracks allow for bike, pram and wheelchair access as well. The brochure can be downloaded at **www.derwentestuary.org.au**.

ELECTROLYSIS BASEMENT SEALING AT NYRSTAR HOBART

In 2010 Nyrstar Hobart commenced a program to progressively seal the basement area of the Electrolysis Department at the Risdon smelter site to prevent process spills and wash water infiltrating the underlying soils and groundwater. Since then nearly half of the area (4200m²) has been sealed with a tough poly-urea barrier at a cost of $3 million. This program, coupled with the seven groundwater interceptions systems on-site, is a major contributor to improved groundwater management at the Nyrstar site.

HANDS-ON LEARNING OPPORTUNITY FOR STUDENTS

To promote learning about local biodiversity and sustainability issues, the DEP has recently developed a range of web-based materials, hands-on activities and interpretive walks that feature important natural habitats of the Derwent estuary. Detailed information packs and maps enable primary school teachers to lead their class on interpretive walks to Lauderdale saltmarsh, Goulds Lagoon and the Hinsby Beach foreshore. Supporting materials focus on 'discovery points', wildlife detective activities, and sensory exploration, to fully engage students. A range of classroom activities complement the interpretive walks, or can be used independently, and include food web games, role-plays, quizzes, and web-search research projects. More information about the classroom and outdoor activities can be found on the DEP website at **www.derwentestuary.org.au/educational-resources/** along with interesting facts on over 90 Derwent plants and animals. This work was supported in part by an Australian Government Community Coastcare grant.

WATER QUALITY MONITORING SITES IN 2011-12

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 2011-12

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

INDUSTRIAL DISCHARGES IN 2011-12

- > 50 000 kL/d

TASMAP
www.tasmap.tas.gov.au

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