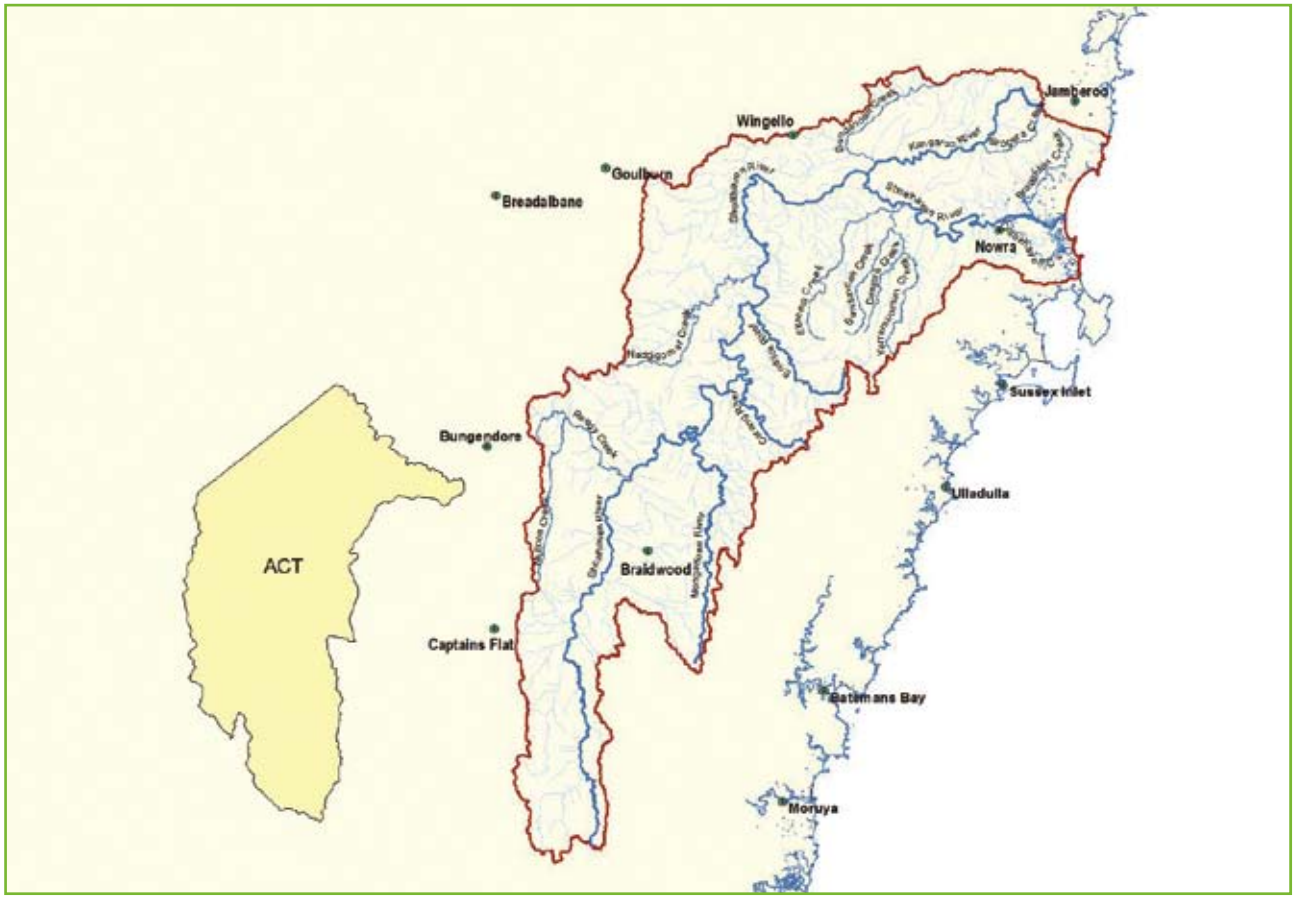
Case Study: 1. The Shoalhaven River Catchment

The NSW coastline is a great natural asset, making an enormous contribution to the economy. The resources of coastal catchments such as the Shoalhaven River Catchment, especially their estuaries and floodplains, collectively support around 90% of the NSW population.

Human activities are placing unprecedented pressure on these coastal resources. There are conflicts over the competing needs of urban development, business, agriculture, tourism, recreation and conservation.

The coast must be managed effectively to ensure sustainability of these resources. A healthy coast is particularly important for tourism, agriculture, aquaculture, recreational and commercial fisheries, as well as biodiversity.



Shoalhaven Catchment, source: Molino Stewart

Important Features of the Shoalhaven River Catchment

The Shoalhaven River Catchment is located on the south coast of NSW and has an area of approximately 7,250 sq km, making it the sixth largest coastal catchment in NSW. The Shoalhaven River has its source in rugged terrain south of Braidwood, and after flowing for 300 kilometres generally in a north easterly direction, enters the Pacific Ocean east of Nowra. The Shoalhaven River has two mouths – one permanently open at Crookhaven Heads; the other intermittently open at Shoalhaven Heads, approximately five kilometres further north.

Shoalhaven estuary, source: courtesy of DECC

Approximately half of the Shoalhaven River Catchment has had minimal disturbance to its native vegetation. About 35% of the Catchment is used for agriculture and a further 11% for forestry. Only about 4% of

the Catchment is urbanised – Nowra being by far its largest urban centre with a population of 31,000 (2006 Census).

The Shoalhaven River **floodplain** covers approximately 5% of the Catchment. The Shoalhaven floodplain is one of the richest dairy areas in NSW. Other significant primary industries are commercial fishing, oyster growing and vegetable farming.

There is a growing tourist industry in the area focussed on water activities such as recreational fishing, surfing, boating. In peak tourist seasons the population of the floodplain can swell four-fold.

The floodplain is also experiencing considerable urban and industrial growth, particularly in and around Nowra and Bomaderry. The Nowra/Bomaderry district is identified as a growth area with the population expected to increase by up to 50% in the next 25 years.

There are several significant industries in the area including the Australian Paper mill and the Manildra Group starch and gluten plant, the largest in Australia. The HMAS Albatross Naval Base is also located close to Nowra. Numerous defence personnel and affiliated industries have located in the vicinity of the Base and it provides a major input to the region's economy, being the largest employer.

Crookhaven estuary with the Shoalhaven estuary to the north, source: courtesy of DECC

Dairying in the Lower Shoalhaven Catchment, source: OceanWatch Australia

Oyster farming in the Shoalhaven, source: Lyn DeSoto, Shoalhaven oyster farmer

Australian Paper Mill, source: OceanWatch Australia

The majority of the **upper catchment** is in national park, with other land uses being beef cattle and wool production. There are an increasing number of hobby farms and agribusiness enterprises (e.g. olive production, farm forestry) in this part of the Catchment.

The Sydney Catchment Authority manages the Tallowa Dam, and Fitzroy Falls and Wingecarribee reservoirs in the upper catchment. Water from these storages is used to supply local communities and supplement other SCA storages during drought. Power is also generated through the regular exchange of stored waters between Lake Yarrunga, Bendeela Pondage and Fitzroy Falls Reservoir.

Tallowa Dam, source: Sydney Catchment Management Authority

Many important Aboriginal places throughout the Catchment reflect the long history of indigenous use of the area and a cultural attachment to its natural resources extending over thousands of years.

Snapshot on Important Aquatic Habitats of the Lower Shoalhaven River

The Shoalhaven River estuary extends 50 kilometres upstream from the ocean. The estuary has large areas of highly significant wetland that are amongst the most extensive on the NSW coast. There are also significant areas of seagrass (1km^2), mangroves (3.5km^2) and saltmarsh (1.5km^2) within the estuary.

The Shoalhaven estuary has considerable ecological value. A total of eight Endangered Ecological Communities are represented in the estuary. The estuarine environments are the home of many wetland and migratory bird species. These environments in the Shoalhaven have been recognised as internationally significant sites for the Eastern Curlew and nationally significant site for the Pacific Golden Plover, Lesser Sand Plover and Ruddy Turnstone. They are also important habitat areas for marine life such as fish, prawns and other seafood species.

Mangroves and oysters in the Shoalhaven River, source: Lyn DeSoto

Saltmarsh, Shoalhaven River, source: SRCMA (Lyall Bogie)

Three particularly important habitats in the Shoalhaven River estuary are:

- Coomonderry Swamp. This provides drought refuge and habitat for a broad range of species including the endangered Green and Golden Bell Frog. According to a National Parks and Wildlife Report, it is the only large semi-permanent freshwater wetland on the south coast and protects approximately one third of this type of habitat within NSW.
- Comerong Island. Has the largest remaining area of littoral (coastal) rainforest on the south coast.
- Lake Wollumboola. Is the NSW south coast's largest shallow, saline coastal lagoon and home to many key bird species.

Many of the habitats of the Shoalhaven estuary are at risk or have declined in area. For example, although a few of the wetlands have increased in size, most have decreased during the past 20 years e.g. Broughton Creek wetland decreased in area by 20% and Greenwell Point wetland by 50%.

Cleared vegetation on the banks of the Shoalhaven River, source: NSW DPI (Allan Lugg)

The main causes of the decline of these aquatic environments are:

- clearing of vegetation from the banks of the Shoalhaven River and its tributaries;
- floodplain drainage and flood mitigation schemes that can cause changes to the flow of streams;
- acid water caused by the disturbance of acid sulfate soils;
- barriers to fish passages including floodgates, roads and culverts; and
- extraction of water from the River for irrigation and other purposes that changes the water flow through the estuary.

It is therefore important to understand that all activities within a catchment cumulatively impact on land and water resources downstream – particularly on aquatic habitats such as saltmarsh, seagrass and mangroves and the fisheries they support – and thus must be managed to minimise such negative impacts that result in declines in these habitats (see fact sheets on *Estuaries and Land and Water Management Issues in the Lower Shoalhaven River Catchment*).

What are some of the Natural Resource Management Issues of the Lower Shoalhaven River Catchment?

Some of the issues related to the management of natural resources in the Lower Shoalhaven River Catchment include:

- the possible impacts of climate change (e.g. changes in salinity levels, migration of mangroves and saltmarsh habitats) that could cause the reduction in breeding habitats for fish and other species;
- increased urban and industrial development that could impact on water quality in the estuary;
- spread of noxious and environmental weeds in the Lower Catchment;
- further floodplain drainage that can cause the disturbance of acid sulfate soils;
- reduced sustainability of farming practices as a consequence of climate change impacts;
- bank erosion that can cause the sedimentation of streams;
- specific pollution sources such as sewerage spills and dairy farm effluent;
- lack of connectivity (corridors) between important habitats for native plants and animal species;
- upstream dams and water extractions that can elevate salinity levels in the lower catchment;
- instream structures such as Burrier Weir that can impede fish migration;
- wildfires and poorly planned hazard reduction fires that can degrade sensitive habitat such as swamp forest and floodplain wetlands;
- feral animals such as foxes, cats, pigs and Indian Mynas, that can have an impact on native animals, such as displacing the native birds from their nesting and feeding areas; and
- possible spread of noxious marine algae from nearby St Georges Basin.

These issues are being addressed through the implementation of plans such as the Shoalhaven River Estuary Management Plan, Southern Rivers Catchment Management Authority's (SRCMA) Catchment Action Plan, SRCMA's Lower Shoalhaven Subregional Plan and encouraging sustainable practices by those living and working in the catchment. For more details about local natural resource management see the fact sheets on Land and Water Management Issues in the Lower Shoalhaven River Catchment, *Waste Management in the Lower Shoalhaven River Catchment* and *The Lower Shoalhaven River Catchment Fishing Industry*.

Street near the urban centre of Nowra, source: OceanWatch Australia

Case Study: 2. Land and Water Management Issues in the Lower Shoalhaven River Catchment

What are Some of the Land and Water Management Issues in the Shoalhaven River Catchment?

Land and water within a catchment is often managed for multiple benefits that might include such things as agricultural production, biodiversity conservation, good water quality, soil health, flood mitigation and for supporting human lifestyles and living places.

Quite often there are competing interests in land use and water management outcomes. For example, an irrigator may wish to extract more water from the river in times of drought, whereas a fisher would want this water to remain in the river for wetland health and fish survival. Thus there needs to be cooperation between individuals, groups and governments to balance often opposing social, economic and environmental needs.

Sometimes people get things wrong and past practices and approaches need to be stopped, refined or modified.

The Shoalhaven River Catchment has many land and water management issues that are typical of other catchments and estuaries along the NSW coast.

However, these issues have specific details and management options that are unique to the Shoalhaven River. According to plans such as the Shoalhaven River Estuary Management Plan, the main land and water management issues in the Lower Shoalhaven Catchment are:

- increased urban and industrial development;
- flood mitigation works;
- acid sulfate soils;
- streambank erosion;
- specific pollution sources;
- catchment flows;
- barriers to fish passage; and
- the possible impacts of climate change.

Industry alongside the Shoalhaven River (starch plant), source: OceanWatch Australia

How are the Land and Water Issues in the Catchment Managed?

1. Increased urban and industrial development

Considerable urban growth is planned for the Lower Shoalhaven River Catchment area, particularly in the Nowra and Bomaderry area. Within the next 30 years, it is estimated that the population in this area will rise from 43,000 to 65,000. Expansion in industry is planned and encouraged by Shoalhaven City Council.

Increased urban and industrial development can have major impacts on land and water if not managed properly. For instance, clearing for development can destroy sensitive environments. New urban areas and industrial development can increase pollution flowing to local waterways and estuaries.

The potential impacts of new development on land and water are mainly managed through Commonwealth, State and local council regulations and plans. What development is allowable is generally prescribed under the Shoalhaven Local Environment Plan 1985, State Environmental Planning Policies (SEPPs), Development Control Plans (DCPs) and other policy at the local government level. Development applications are then reviewed by Shoalhaven City Council in relation to a broad suite of laws, plans and policies to minimise

the impacts on the environment. When an industry operates it comes under further scrutiny especially in relation to air and water pollution.

Although planning and regulations are the main ways to manage the environmental impacts of urban and industrial development, there are several other local initiatives including:

- a large water recycling scheme developed by Shoalhaven City Council that will utilise up to 80% of reclaimed water from six Shoalhaven wastewater treatment plants to irrigate local dairy farms, golf courses and sports fields;
- stormwater education programs run by Council that aim to encourage urban dwellers to carry out practices to minimise stormwater pollution run off; and
- water quality monitoring program run by Council that can isolate pollution sources.

Expanding residential areas in Nowra, source: OceanWatch Australia

2. Flood mitigation works

Flood mitigation works such as floodgates have been installed in several NSW estuaries including the Shoalhaven River estuary. They are designed to prevent inundation of low-lying land by high tides or flood events.

Flood mitigation works can have some negative impacts on aquatic life if managed poorly. The NSW Department of Primary Industries (DPI) has identified 12 potential negative impacts of flood gates including them acting as barriers to the migration of juvenile fish and prawns and fragmenting habitat.

Southern Rivers Catchment Management Authority (SRCMA) and the NSW Department of Primary Industries (DPI) are working with local councils and landholders to manage flood mitigation works in ways that are more sensitive to aquatic life as part of the Bring Back the Fish Program. This primarily involves removing and/or modifying several floodgates on the Shoalhaven estuary. More details can be found at:

Floodgates on the Crookhaven River, source: NSW DPI (Scott Nicols)

http://www.dpi.nsw.gov.au/fisheries/habitat/rehabilitating/floodgate#The-steps-to-managing-a-floodgate

3. Acid Sulfate Soils

Acid sulfate soils (ASS) is the common name given to soils and sediments containing iron sulfides. These soils are found throughout the floodplains of NSW coastal rivers, including the Shoalhaven River.

ASS were formed over millions of years in marine sedimentary rocks but it is those formed since the last major sea level rise that are of most concern. These more recent sediments are usually found in low lying areas such as around coastal wetlands.

As they were originally laid down in anaerobic (oxygen-depleted) conditions, once the soils are disturbed they react with oxygen and water to form sulfuric acid. This acid can then flow into local drains, creeks, rivers and estuaries causing major impacts on aquatic life, including fish kills.

ASS can be managed by preventing any disturbance to them. To do this it is critical to know their location and prevent any works that may in some way expose them to oxygen. One of biggest threats to ASS are floodplain drainage works that although aim to better drain water in the floodplain, can disturb ASS.

ASS have been exposed in the Lower Shoalhaven River Catchment, particularly around Broughton Creek. This has mainly been caused by the draining of low lying land for dairy farming and cattle grazing. The exposure of the soils has led

Acid sulfate soils, Greenwell Point, source: NSW DPI (Allan Lugg)

to water quality problems causing fish kills often during rain events that follow a low rainfall period such as a drought.

Apart from trying to avoid future disturbance of the ASS, management options include the use of floodgates to control drainage and allow tidal water to neutralise acidity.

4. Streambank erosion

Bank erosion is part of natural stream processes; however, the activities of people can greatly exacerbate it. If left unchecked, bank erosion can devour valuable farming land and even endanger homes. The sediment eroded from the banks can wash downstream compromising the quality of water for rivers life, farming purposes and recreation. It can greatly impact on estuarine habitats by smothering seagrass and blocking channel flow.

Bank erosion is a considerable problem along the Lower Shoalhaven River and its tributaries. There are numerous places where banks are unstable and deeply gouged. Studies show that the causes of the erosion are complex and include:

- scouring by floods;
- scouring by tidal currents;
- wind waves;
- waves causes by boating;
- removal of riverbank vegetation e.g. causes by stock trampling, clearing; and
- natural meandering of the stream.

Riverbank erosion Broughton Creek, source: NSW DPI (Allan Lugg)

The impact of bank erosion on local wetlands is of particular concern. Sedimentation originating from the erosion can smother the wetlands causing further decline of these critical estuarine habitats for bird and aquatic life.

Options to manage streambank erosion in the Lower Shoalhaven River Catchment are listed in the Shoalhaven River Estuary Management Plan and include:

- zone all riverbank to ensure there is no development that may cause excessive erosion;
- replant reed beds and mangroves to help protect banks from wind waves;
- construct rock walls or groynes to protect severely eroding banks where it threatens recreation reserves and major infrastructure;
- manage speed boat behaviour close to where boat waves contribute to erosion;
- monitor bank erosion along the River; and
- fence riverbanks to exclude cattle access/trampling and the destruction of riverbank vegetation.

The Shoalhaven River and Estuary Five Year Investment Strategy is funding two actions that will help reduce future streambank erosion. These actions are:

1. Installing fencing and off-stream watering points to exclude stock from riverbanks at priority points
2. Broadscale planting of mangroves and reeds in vulnerable parts of the River.

Several projects have already been carried out to address bank erosion that involve government (Southern Rivers Catchment Management Authority, other state government agencies, Shoalhaven City Council) and local landholders working together.

Greencorps team helping landowners fence cattle out of the Shoalhaven River, source: SRCMA

For example, some of the eroded banks close to the mouth of the Shoalhaven River have been rehabilitated through a four step process:

Step 1. Develop agreements to carry out the works with local landholders.

Step 2. Reshape the eroded banks and construct a rock wall

Step 3. Planting vegetation to further stabilise the bank and fence off areas to prevent trampling by stock

Step 4. Maintain vegetation until it has become established

More details about this project can be found at:

http://www.southern.cma.nsw.gov.au/pdf/ShoalhavenRiverCaseStudy3.pdf

In another project involving the Southern Rivers Catchment Management Authority and local partners including Landcare and Riverwatch groups, mangrove and other plant species are being planted to stabilise banks below the Nowra Bridge. This project has resulted in the resulted in the restoration of over four kilometers of riverbank. More details about the project can be found at:

http://www.southern.cma.nsw.gov.au/pdf/ShoalhavenRiverCaseStudy2.pdf

5. Specific pollution sources

There are several specific sites in the Lower Shoalhaven River Catchment that are potential sources of pollution. These local 'point source pollution sources' include:

- Sewage Treatment Plants (STPs);
- industries; and
- agricultural enterprises e.g. dairy farms

Dairy farm in the Shoalhaven, source: OceanWatch Australia

Nowra Wastewater Treatment Plant, source: OceanWatch Australia

There are three STPs – located at Berry, Bomaderry, Nowra – that can have a major impact on the water quality of the Lower Shoalhaven River and estuary. All STPs are licenced polluters and regulated by the NSW Government. Each of these STPs run by Shoalhaven Water, has the highest level (tertiary) treatment. All of the biosolids from the STPs are re-used and 30% of the water from them is re-used.

There are a further 40 industrial premises in the area that are also licensed polluters and regulated by the NSW Government. These premises include:

- concrete works;
- extractive industries;
- paper production;
- waste facilities; and
- animal slaughtering.

Some local industries are also taking their own measures to minimise water pollutants emanating from their sites. For example, Manildra's Nowra starch and ethanol plants generate a water based waste stream containing soluble organic nutrients. An environmental

Manildra's Nowra starch and ethanol plant, source: OceanWatch Australia

farm adjacent to the Nowra site, on the banks of the Shoalhaven River, has been established to manage the large volumes of liquid effluent generated by its industrial operations. The waste water is applied using very large centre pivot regulators, which maximise the hydraulic capacity of the soils and optimises pasture growth.

Agricultural enterprises can also be sources of water pollution. Of particular concern in the Lower Shoalhaven Catchment is the effluent originating from dairy farms. There are some local projects that aim to help dairy farmers minimise effluent flows off their property. One of these projects is the SRCMA's Shoalhaven Illawarra Dairy Industry Partnership Project which aims to provide support dairy farmers in the Shoalhaven and Illawarra to implement sustainable resource management projects and improve effluent management systems.

In another project, the SRCMA is partnering with local dairy farmers and oyster growers to reduce cattle wastes (in the form of faecal coliforms) that can foul water around oyster leases. According to the CMA, the project has:

- constructed 20 kilometres of fencing to exclude stock from approximately 75 hectares of river bank close to the oyster leases;
- excluded 500 head of cattle from the estuary, potentially preventing 5.5 million kilograms of direct faecal and nutrient pollution per year;
- assisted dairy farmers and oyster growers to meet best practices in managing natural resources within their operations; and
- developed long term management agreements with landholders to ensure sound management of project sites.

Further information about this project can be found at:

http://www.southern.cma.nsw.gov.au/pdf/ShoalhavenRiverCaseStudy1.pdf

More details about water quality issues can be found in the fact sheets on Waste Management in the Lower Shoalhaven River Catchment and The Lower Shoalhaven River Catchment Fishing Industry.

Dairy cattle fenced out from riverbanks near oyster leases, source: OceanWatch Australia

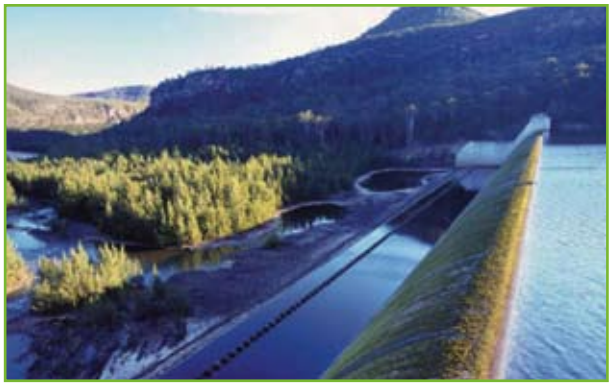
6. Catchment flows

To maintain a healthy estuary, it is important to have flows to it from the upper catchment that are as natural as possible. These 'natural flows' are highly variable (i.e. range from very low flows to floods) and critical in maintaining estuarine habitats.

There are upstream water extractions that can influence water flow into the Lower Shoalhaven River Catchment and estuary. These include extractions by the Sydney Catchment Authority, Shoalhaven Water (for town water supplies) and farmers along the River.

The Sydney Catchment Authority (SCA) operates three main storages – Tallowa Dam, and Fitzroy Falls and Wingecarribee reservoirs – located in the upper catchment of Shoalhaven River. Water from these storages is used to supply local communities and supplement other SCA storages during drought. Power is also generated through the regular exchange of stored waters between Lake Yarrunga, Bendeela Pondage and Fitzroy Falls Reservoir.

Studies are being carried out to investigate the impacts of the water extractions on the habitats of the Shoalhaven estuary. Of particular concern is the impact of the Sydney Catchment Authority's drought extractions during low flow periods in the River.



Tallowa Dam, source: Sydney Catchment Management Authority

There has been considerable controversy (see newspaper article) over a NSW Government plan to pump water from the Shoalhaven River on a more regular basis in an effort to secure Sydney's water supply.

NEWSPAPER ARTICLE

http://www.smh.com.au/news/national/sydneys-great-river-robbery/2006/08/25/1156012745627.html

SYDNEY will take billions of extra litres of water a year from the Shoalhaven River, possibly via a tunnel costing several hundred million dollars.

The decision is part of the State Government's effort to secure Sydney's water supply in the face of the pressures of over-consumption and climate change.

On Monday the State Government will publish a discussion paper detailing its plan to pump as much as 105 billion litres a year from the river, scrapping the system of only using Shoalhaven water in drought. This is 10 per cent of the Shoalhaven's flows, although in most years only half this would be used.

The move has dismayed some South Coast residents and green groups, who fear that further exploitation of the Shoalhaven will hurt fishermen, farmers, oyster leaseholders and tourism.

Every million litres pumped from the Shoalhaven costs $57 and produces two tonnes of greenhouse gases. The threat of carbon dioxide emissions worsening climate change was one of the main reasons the Government abandoned the desalination plant.

Sydney has resorted to taking the Shoalhaven's water three times in the past quarter of a century, but now it will be on tap. The new trigger for taking the river water, under the Government's plan, is likely to be when the city's dam levels fall below 85 per cent capacity.

On Thursday the dam levels were still falling, down to 41.2 per cent capacity, and they have been below 45 per cent for the past two years. During this drought Sydney has been permitted to take a long-term annual average of 75 billion litres from the Shoalhaven. The water is delivered to the Nepean, Avon and Warragamba dams via the Wingecarribee River and Doudles Folly Creek, causing significant ecological damage to these waterways and localised flooding.

The Sydney Catchment Authority is keen to see this degradation ended. There is consensus that it would devastate the ecology of these waterways to increase their use as drains. The preference of experts and environmentalists is likely to be a pipeline three metres in diameter and 20 kilometres long, through the Southern Highlands to Avon Dam. From Avon the water can be sent to Prospect Reservoir in Sydney.

Such a tunnel could move 1500 million litres a day and generate hydro-electricity to offset up to 60 per cent of pumping costs and greenhouse emissions. But the chairman of the Shoalhaven River Alliance, Terry Barratt, of Bomaderry, fears the pipeline would make it difficult to limit how much water Sydney takes.

More information about the progress of this plan can be found at:

http://www.waterforlife.nsw.gov.au/about/plan

NEWSPAPER ARTICLE

South Coast Register, 21/7/08, by Adam Wright

Low flows are killing our oysters

SHOALHAVEN'S $1 millon oyster industry is starving to death.

The lack of fresh water being let out of the Sydney Catchment Authority-controlled Tallowa Dam is hurting oysters in the lower Shoalhaven River and the river itself according to Shoalhaven River Oysters Inc co-ordinator Lyn Desoto.

"The current environmental flow is 90 megalitres per day. It should be 270 megalitres per day but the Sydney Catchment Authority (SCA) won't change it until Warragamba Dam is over 70 per cent full.

"But they've taken the water restrictions off Sydney when it reached 68 per cent, so figure that out," she said.

Ms Desoto said the SCA was pumping water to add to flows down the Hawkesbury River.

"So Shoalhaven River water is being used to help with the Hawkesbury River environmental flow when our river needs it."

She said the impact on the oyster industry was that salinity was too high, the water temperature has dropped dramatically and there isn't as much 'food' in the water.

"The water they're releasing from the dam is dead. It's from the bottom of the dam and it's too cold, isn't oxygenated and has little nutrient in it.

"Sydney Catchment Authority swear to us that it's oxygenated and warmed by the time it gets to us. Yes it's oxygenated but that's it.

"Our water temperatures are down by four degrees on what they should be and it was a pretty rapid drop.

"That's not normal for this time of year, it goes down slowly and regularly. To drop like this is pretty strange.

"The river is saltier too. In drought the river is saltier than the ocean but our river is still saltier now, because we're not getting enough flow."

Ms Desoto said the SCA has plans to cut a gate into the top of the wall to help, but she said the big question is when that will happen.

"It's not just hurting oysters, it's everything else that has to do with the health of the river too," she said.

http://nowra.yourguide.com.au/news/local/news/general/low-flows-are-killing-our-oysters/1060996.aspx

7. Barriers to fish passage

All Australian fish need to move along the streams they inhabit. They need to migrate to find food, shelter, avoid predators and breed. Structures in streams act as barriers to restrict this movement and can greatly impact on fish populations.

Floodgates on the Crookhaven River, source: NSW DPI (Scott Nichols)

A study in the Shoalhaven River Catchment found 90 barriers to fish passage, the most in any NSW south coast catchment. The barriers consisted of:

- 30 culverts;
- 24 causeways;
- 24 floodgates;
- 5 weirs;
- 5 high dams; and
- 2 stream gauging weirs.

There has been considerable activity throughout the Shoalhaven River catchment to reduce the impacts of fish barriers. For example, the NSW Department of Primary Industries (DPI) and the Department of Water and Energy are conducting research into native fish population movements and changes in the Shoalhaven using electronic tracking devices to determine the status of native fish populations and ways to minimise the impacts of barriers in the River. Also part of the Shoalhaven River Estuary and Rehabilitation Program is to remediate and/or remove identified barriers to fish passage.

DPI and the SRCMA are also addressing barriers to fish passage through the Bringing Back the Fish Program by removing or modifying some of these structures.

A 'fish lift' is being installed as part of the upgrade of Tallowa Dam. The fish lift will allow for the upstream migration of native fish. A new gated slot through the dam spillway will allow fish to move downstream. More details about this project can be found at:

http://www.dpi.nsw.gov.au/research/updates/issues/july-2008/fish-lift

8. Climate Change

The Garnaut Report and other studies predict considerable environmental, economic and social impacts as a result of 'accelerated' climate change across Australia in the next 50 years.

A study of the possible impacts of climate change in the Shoalhaven and other NSW south coast catchments identified issues that will affect future land and water management in the area.

The study predicted that the future climate of the area would be warmer and drier (causing more drought, higher evaporation). The study highlighted the fact that ' a warming of 1 degree Celsius and a 5 percent decrease in rainfall (a moderate scenario for 2030) would make the climate of Nowra similar to the climate of Parramatta in Western Sydney'. Although this would be the general trend, the report believed there was also the 'potential for increases in extreme rainfall events'.

Impacts on land and water management identified in the study include:

- sea level rise coupled with intense storms causing more inundation of properties in the estuary and coast;
- further bank erosion from increase in flood events;
- general reduction of flows into the Shoalhaven estuary;

Shoreline erosion, Numbaa Island, source: NSW DPI (Allan Lugg)

Shoreline erosion: source UMWELT

- decreases in fresh water runoff and increases in sea water input that may reduce the functioning of estuarine wetlands, the habitats of many bird and aquatic species;
- poorer water quality (e.g. increase in salinity in upper estuary) caused by lower flows and higher temperatures; and
- changes in the distribution of some plant and animal species e.g. landward migration of mangrove and saltmarsh communities; and
- increased risk of bushfires that may damage fire-sensitive communities e.g. swamp forests.

More details can be found from the report at:

http://www.greenhouse.nsw.gov.au/__data/assets/pdf_file/0009/7785/SouthernRiversDetailedFinal.pdf

Further studies are being carried out in the Shoalhaven River Catchment to understand and plan for the impacts of climate change. For instance, there are several strategies in the Shoalhaven River Estuary Management Plan to adapt to sea level rise and other impacts of climate change including:

- protect wetland areas that could changed by sea level rise;
- communicate information about sea level rise implications, especially to primary producers and those that live near the River or on the coast;
- remove barriers to fish passage to allow fish to adapt to changes in sea level;
- review the zoning of land in relation to sea level rise and the increased risk of flooding;
- prepare guidelines about climate change risks for the oyster industry; and
- monitor the estuary for indicators of climate change.

Although climate change is a global issue, there are numerous actions that people and organisations can generally take to minimise its impacts. Details of these actions can be found at:

http://www.greenhouse.nsw.gov.au/home_page

http://www.greenhouse.gov.au/

Case Study: 3. Waste Management in the Lower Shoalhaven River Catchment

What are the Waste Management Issues of the Shoalhaven River Catchment?

With increasing population, increasing living standards and a growing tourism industry, waste creation in the Shoalhaven River Catchment is likely to increase. All types of waste have a potential to impact negatively on the environment and, in particular, water quality. Water quality is critical to the survival of estuarine and marine ecosystems on which many Shoalhaven River Valley industries depend. The fishing/seafood industry, in the Shoalhaven River coastal zone (estuary and ocean) is particularly vulnerable to declining water quality which in turn affects fish habitats, fisheries and oyster productivity as well as conditions for oyster harvesting (which is directly dependent on water quality).

Waste Streams or Sources of Waste in the Shoalhaven River Catchment

Solid Waste

The total population of the Lower Shoalhaven River Catchment in 2006 was 43,000 and is increasing at an average annual rate of about 1.7%. Nowra, Bombaderry, Culburra and Berry are the main urban centres in the Catchment.

A total solid waste stream of 91,000 tonnes from households and businesses was produced in 2006/2007 in the Lower Shoalhaven River Catchment, with most waste coming from packaging. See Shoalhaven Waste Management data at

New landfill, West Nowra, source: Shoalhaven City Council

http://www.shoalhaven.nsw.gov.au/council/pubdocs/soe/Region/Issues/Wastemanagement%20ass%20and%20back.htm

What are the possible impacts of increasing amounts of solid wastes?

The impacts include:

- loss of natural resources used to create the packaging and products;
- an increasing demand for landfill sites;
- impacts on water quality:
  - chemicals and other pollutants from landfill sites may escape into groundwater and enter nearby streams and rivers.
  - leachate develops when waste is buried and decomposes. This can also seep into waterways and cause serious pollution and result in eutrophication (increasing nutrient levels), algal blooms, loss of aquatic habitats and fish kills; and
- impacts on air quality from landfill sites and burning solid waste:
  - Ethane, a greenhouse gas can escape into the atmosphere.
  - Dumps act like large compost heaps and can heat up and catch alight.
  - Dumps are smelly and unattractive and can contribute to air pollution on windy days.

Liquid Waste

Many businesses also produce what is known as ‘liquid trade waste’. This waste is usually discharged into the sewerage system and is additional to liquid wastes from showers, toilets, and baths. The types of premises producing liquid trade waste include restaurants, coffee shops, supermarkets, hairdressers, funeral parlours,

dry cleaners, clubs, laundromats, abattoirs, service stations, car wash facilities, marinas and sewage treatment plants (STPs).

Some of the identified high risk or high volume liquid waste producers require a special licence from the Department of Environment and Climate Change (DECC). These activities or businesses are said to be 'scheduled' and include concrete batching plants, STPs and intensive agriculture enterprises (e.g. piggeries, feedlots) above a certain size.

Service station, Berry, source: OceanWatch Australia

What are the consequences of poor liquid trade waste management?

The consequences include:

- Grease, oil, solid material, if not removed on-site may cause blockages in the sewerage system and result in overflows of untreated sewerage into the environment.
- Strong waste may cause odour problems and corrosion of the sewerage system infrastructure with potential environmental impacts such as leaks or seepage of sewage into waterways.
- Failure of septic/sewage systems can close the river to harvesting for several months as has occurred previously in the Shoalhaven.
- Illegal practices may lead to serious pollution of the waterway including fish kills, mangrove die-off and other long term harm to the waterway and estuary. Such events are investigated by the DECC with heavy fines and cleanup notices imposed.

Those Shoalhaven River industries that are licensed to dispose of their liquid wastes into the Shoalhaven River include a paper mill, starch plant and STPs. The DECC licensing schemes usually contain incentives to reduce the level of contaminants entering the waterway, including hefty licensing fees. These fees collected by DECC are directed back into improving the environment through the NSW Environmental Trusts.

Starch plant also located next to the Shoalhaven River, source: OceanWatch Australia

Australian Paper Mill located next to the Shoalhaven River, source: OceanWatch Australia

Construction Waste

Soil that is exposed at construction sites can be washed from the sites into stormwater drains if measures to keep it at the site in place (sediment controls) are poor. This sediment is eventually deposited into the Shoalhaven River or its tributaries and can even make its way into the ocean.

Although a single block of land may seem a small part of the river catchment, the cumulative (additive) effect of polluted, sediment-rich runoff from a number of building sites can have a dramatic impact on water quality.

Thus, there are a number of environmental impacts directly associated with sediment pollution from

Exposed soil at a construction site, source: OceanWatch Australia

building sites. For example, water which runs off building sites, carries pollutants like soil and soil nutrients, as well as building materials such as concrete residues, and enters stormwater drains with subsequent pollution of natural waterways. Furthermore, changes that are made to natural land surfaces and drainage patterns during construction and urban development can result in natural watercourses becoming turbid, silted, littered and undesirably enriched with nutrients ('eutrophication'). This nutrient-rich water often promotes development of algal blooms. When turbid water restricts sunlight filtration, photosynthesis is reduced and productivity of the aquatic ecosystem suffers. This affects habitats (particularly seagrass), marine life and has negative consequences for the fishing and oyster industries.

Most local councils have sediment and erosion guidelines for building and construction work. The approvals for these types of development generally require inclusion of the sediment and erosion control procedures to be employed or are these are required as a condition of consent by council. More details about Shoalhaven City Council's guidelines for construction can be found at:

http://www.shoalhaven.nsw.gov.au/council/sections/Development/index.htm

Construction also produces a significant amount of solid waste. About 20% of the solid waste taken to the West Nowra landfill comes from construction sites and is mainly concrete and metals (much of which can be recycled).

Agricultural Waste

Dairying

Dairying is an important agricultural activity in the Shoalhaven River Catchment that can pose an environmental threat to the Shoalhaven River and estuary. It requires the regular congregation of large numbers of cattle to a small area for milking. This can lead to high levels of nutrient runoff from accumulated faecal matter entering and polluting waterways unless these milking areas are well positioned and designed. Dairy cattle can also pollute waterways with nutrient rich faecal matter if they are allowed unrestricted access to rivers or creeks.

Cattle with direct access to the river, pollute the water with their waste, source: NSW DPI (Allan Lugg)

Oyster growing

There are five main oyster growing areas in the Shoalhaven River estuary. Oyster growing is greatly dependent on excellent water quality and an ongoing concern for the Shoalhaven industry has been high faecal coliform levels (originating from animal wastes) especially during times of low flow in the catchment.

The Southern Rivers Catchment Management Authority is working with dairy farmers that have properties adjacent to the oyster leases to attempt to minimise the impacts of unrestricted cattle access on the River. To achieve this, 20 kilometres of foreshore have been fenced to exclude cattle. As a result, the number of days the River has been closed for oyster harvesting due to high faecal coliform levels has been significantly reduced.

Oyster leases in the Shoalhaven River, source: SRCMA

The oyster industry itself has several waste products that need to be carefully managed. Traditional oyster farming practices have relied on tar-coating oyster poles and trays to preserve the timber. This tar poses a potential risk to the river's water and sediment by gradually leaching toxic chemicals such as hydrocarbons. However, many oyster farmers have replaced the tar-coated poles and trays with recycled plastic poles and floating baskets. Around 70% of the Shoalhaven oyster farmers have already undertaken this. The SRCMA has also partnered with the oyster industry in a one-off clean up of derelict oyster leases with over 40 tonne of rubbish removed and 20 tonnes of timber recycled from the Shoalhaven.

Fishing Industry Waste

As outlined in the fact sheet on the Lower Shoalhaven River Catchment Fishing Industry, waste generated by the fishing industry can include:

- plastics;
- fishing line and nets;
- offal (left over carcass from filleting/processing); and
- fuel emissions.

One of the main issues for this industry is the impact of discarded fishing equipment such as tangled fishing line, torn nets, hooks and ropes etc which pose a threat to aquatic life. It should be noted, however, that the fishing industry is only one of the possible sources of marine debris and other waste impacting on estuaries and marine ecosystems.

Oyster farming in the Shoalhaven using recycled plastic poles and trays, source Lyn DeSoto, Shoalhaven oyster farmer

Stormwater Runoff

The creation of impervious surfaces such as roads, roofs, driveways, footpaths and pavers, creates a significant increase in stormwater runoff volume and duration. These increased flows may carry sediment, litter and organic waste into waterways through the kerb and gutter system. This stormwater then can carry nutrients and other wastes into the Shoalhaven River resulting in increased siltation and nutrient pollution.

Fishing waste, source: OceanWatch Australia

Sewage

There are four main Sewage Treatment Plants (STPs) in the Lower Shoalhaven River Catchment. These are located near the larger population centres of Nowra, Bomaderry, Shoalhaven Heads and Berry.

Wastewater collected in the sewerage system flows to the STPs where it is either treated or reused. Discharges from the STPs are monitored regularly to ensure that they comply with standards set out by the NSW Government.

According to Shoalhaven Water which manages sewage disposal in the Catchment, use of recycled water has increased from 300 million litres a year in 2001 to approximately 1,600 million litres a year in 2006/2007. This will grow to 2,500 million litres a year by 2015.

Kerb and gutters in Nowra streets, source: OceanWatch Australia

Air pollution from waste

Air quality in the Shoalhaven Valley is influenced by bush fires, controlled burning for hazard reduction, industrial discharges both licensed and unlicensed, solid fuel heaters, backyard burning of green waste, transport pollution including private vehicle use, commercial cooking activities, sewage treatment plants, landfills, dust from agriculture and building activities, and indoor air pollution from activities such as smoking and heating.

Landfill generates methane, a flamable greenhouse gas, source: OceanWatch Australia

The impacts of air pollution in the Shoalhaven River Catchment include:

- contributing to global warming
- contributing to ozone depletion
- declining water quality when the air borne wastes settle onto and/or wash into waterways
- human health issues from air borne particles.

Water pollution from waste

The *Independent Inquiry into the Shoalhaven River System (2004)* by the Healthy Rivers Commission summarises the major water quality issues of concern throughout the Shoalhaven Catchment. The issues include:

- potential acid sulfate soils (see fact sheet on *Land and Water Management Issues in the Lower Shoalhaven River Catchment*);
- management and disposal of wastewater;
- impacts of urban expansion around Nowra (see fact sheet on *Land and Water Management Issues in the Lower Shoalhaven River Catchment*);
- impacts of various industries located along the river; and
- streambank erosion (see fact sheet on *Land and Water Management Issues in the Lower Shoalhaven River Catchment*).

Runoff from urban areas can result in nutrients being washed into Shoalhaven River via gutters, source: OceanWatch Australia

Nutrients, in small amounts, are required for plant growth but in large amounts they can cause excessive algal growth in waterways (including noxious blue green algae) which can put natural ecosystems out of balance, harming water-life and animals. Blue-green algal growth can also seriously affect human uses of water for purposes such as drinking, recreation, stock water and irrigation.

Sediment smothers aquatic habitats such as seagrass and high turbidity interrupts photosynthesis. Both of these events reduce plant production and interrupt food chains. These habitats are important breeding grounds and nurseries for many aquatic species such as prawns and fish. If breeding is interrupted and nurseries destroyed, fishing productivity is reduced and therefore the fishing industry (recreational and commercial) and the oyster industry suffers.

Major sources of nutrients in the Shoalhaven River Catchment are:

- run off from urban and rural residential areas;
- erosion and chemical run-off from grazing and cultivated land;
- effluent from dairy farms;
- discharges from sewage treatment plants and septic systems; and
- run off water from industries along the river.

What are Some of the Ways These Waste Management Issues are Dealt with in the Shoalhaven River Catchment?

Waste management is an issue that we can all influence. Some of the ways we can reduce the impact of wastes on the environment are:

- reduce the production of waste and therefore the demand for natural resources;
- dispose of all types of waste in a way that minimizes environmental and human impacts;
- recycle or reuse waste products where possible to reduce the demand on natural resources and the need to dispose of the waste into the environment; and
- educate groups and individuals on the role they can play in waste minimisation and responsible disposal of waste to minimize environmental impacts.

Shoalhaven City Council's community workshop on composting, source: Shoalhaven City Council

Councils, schools, State and Commonwealth Governments along with individuals have a responsibility to educate themselves and others about how to improve waste impact from their own activities on the environment.

There have been several strategies implemented to manage waste in the Lower Shoalhaven River Catchment. Some of these strategies are described below in this fact sheet.

While a lot has been achieved there is still progress to be made to reduce the environmental impacts from waste and in particular the impacts on water quality caused by waste disposal.

What are the Types of Strategies for Improving Waste Management?

What can governments do?

In NSW, the Department of Environment and Climate Change (DECC) is the lead government agency responsible for state-wide regulation of waste management. Local government is vested with the regulatory responsibility at the local level for carrying out waste management services within this state-wide framework. The Commonwealth Government is also involved through incentives and partnerships with Local and State Governments, as well as with industry. Councils develop policy and operating plans to ensure that they meet their obligations under legislation.

Shoalhaven City Council collection of recycling bins, source: Shoalhaven City Council

How Does Shoalhaven City Council Carry out its Waste Management Functions?

Disposal of solid waste and recycling

Shoalhaven City Council has a comprehensive approach to managing and disposing of solid waste materials within its area. It has ten waste and recycling depots at various locations throughout its area with the largest being at West Nowra. It offers a weekly kerbside collection to properties and a fortnightly collection of recycling bins.

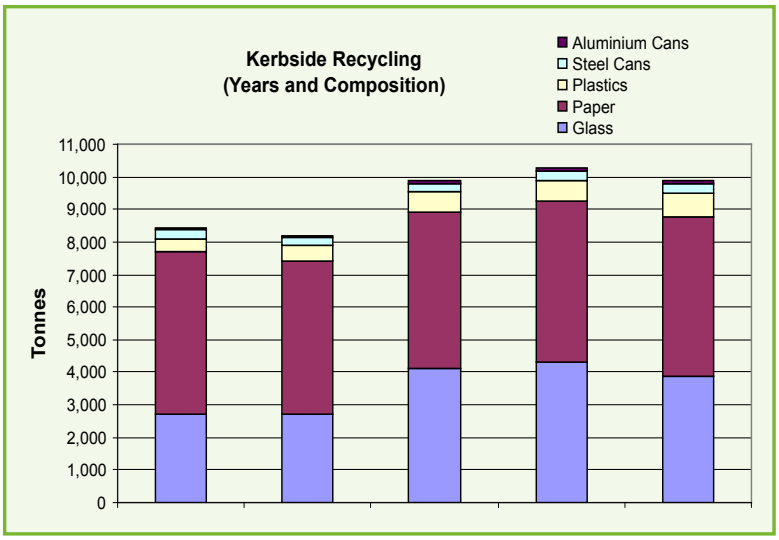
http://www.shoalhaven.nsw.gov.au/council/sections/Waste/WasteRecyclingDepots/waste_&_recycling_depots.htm

Shoalhaven City Council actively supports and promotes recycling to the community due to the wide-reaching environmental benefits that recycling offers. Strategies to encourage recycling and reduce waste being sent to landfill include:

- general waste collection that includes waste and recycling bins to increase the amounts being recycled;
- a wide range of recyclable materials is encouraged;
- a pay for service facility for all garden waste;
- a pay for service facility for large bulky items;
- special waste minimisation services that include special waste disposal, buy back centres, worm farms and composting facilities available;
- recycling at landfill sites;
- encouraging the reuse of materials;
- favouring industries that limit waste production by providing advisory and support services; and
- encouraging the development of new 'greener' technology.

West Nowra waste and recycling depot, source: OceanWatch Australia

As a result of these strategies and community support there have been general improvements in waste management. Although at the West Nowra depot there has been approximately 60,000 tonnes of waste delivered to landfill in each of the last five years, with increases in population there has been a decline in the amount per person delivered. There has also been an increase in the amount of solid waste being recycled with 9,905 tonnes recycled in 2006/07 in the Shoalhaven area.



Recycled materials yield 2002/2007, source: Shoalhaven City Council, State of the Environment Report (2006/2007)

The Shoalhaven City Council also has in place strategies to deal with specific types of waste to reduce environmental and health impacts from wastes that include concrete, soil, cooking oils, out of date medications, toxic liquids, mobile phones, asbestos, pesticides, bulk motor oil, sediment runoff from building and construction sites and the disposal of 'sharps' used by thousands of people at home to treat medical conditions, such as diabetes, cancer or multiple sclerosis.

Disposal of liquid waste

Sewage, liquid trade waste and stormwater waste disposal systems are located throughout the entire Shoalhaven River Catchment. Sewerage treatment plants are monitored under licence to DECC and, where necessary, upgraded to reduce leaks and breakdowns. In many new urban developments, lakes and wetlands are being constructed to filter stormwater waste and protect downstream water quality. Water Sensitive Urban Design (WSUD) is now an important part of planning processes for all new developments.

Shoalhaven Water is developing one of the largest water-recycling schemes undertaken by an Australian water authority. It will utilise up to 80 percent (2,000 million litres) of the reclaimed water from six Shoalhaven wastewater treatment plants to irrigate local dairy farms, golf courses and sports fields.

Unsewered towns and rural properties with on-site sewage systems are managed under Shoalhaven Water's septic tank pump out facility and On-Site Sewage Management DCP 78 which requires certain standards for installation, inspections, minimum treatment standards, and upgrading of treatment systems to reduce environmental threats.

Stormwater

Shoalhaven City Council has a number of strategies to reduce the level of stormwater runoff as well as influence its quality. These strategies are included in its Stormwater Management Plan and the Shoalhaven River Estuary Management Plan.

Council through its Stormwater Management Plan is moving the emphasis in stormwater management from end-of-pipe solutions such as gross pollutant traps (devices that catch litter and other larger wastes before they enter waterways) to ways to minimise pollution at the source. This involves finding out where the main sources are pollution might be and developing ways to minimise them with the community.

Gaseous Waste

Council regulates backyard burning and non scheduled industrial emissions into the atmosphere. This helps reduce waste that impacts on air quality in urban areas. Council is also able to regulate the level of open burning-off under the Protection of the Environment Operations (Control of Burning) Regulation 2000.

Council has participated in the Sustainable Energy Development Authority Energy Smart Homes program that requires new homes meet minimum energy efficiency requirement to reduce greenhouse emissions. New homes must comply with the requirements of BASIX (Building Sustainability Index).

Education

Education for sustainability is a state-wide initiative that recognises the vital role education has across all sectors of the community. Shoalhaven City Council, in recognition of its important local role in educating its community, undertakes a variety of community education programmes to advance awareness, uptake and participation in Council's environmental initiatives including the area of waste reduction.

Shoalhaven City Council's educational slogans, source: Shoalhaven City Council

Council's waste education initiatives include:

- waste management web page at http://www.shoalhaven.nsw.gov.au/council/sections/Waste/Default.htm
- promotion of Clean Up Australia with local businesses, community groups and individuals;
- fridge recycling calendar;
- composting information;
- recycling information; and
- Green Home composting trial.

Community involvement in national initiatives such as 'Clean up Australia' and the NSW Government's various litter reduction campaigns help to promote waste minimisation and appropriate disposal messages in the Shoalhaven River Catchment.

How can locals respond to the local Shoalhaven waste issues?

Businesses, environmental groups, government bodies and individuals can all get involved in waste minimisation projects such as those outlined above.

Often when community members, groups and businesses all get together to work on special projects it benefits the whole community in ways beyond just that project.

For example, over 700 households in the Shoalhaven Council area wanted to be part of Great Green Home Composting Trial. Only 205 households could take part in the trial but if it is successful in reducing the amount of green waste going to landfill the program, it will be offered by Council to the wider community. More details can be found at:

http://www.shoalhaven.nsw.gov.au/council/sections/Waste/SpecialPros/Home%20Composting%20Trial.htm

Further actions individuals can take to minimise waste

Ultimately it is in the home, at play or at work that practices of individuals make a difference.

At home ask the question Do I –

- recycle all the recyclable containers and packaging?
- make sure I don't contaminate waste by putting the wrong things in the wrong bin?
- compost all the organic and green waste that I can?
- ensure that I don't litter?

Reduce waste when shopping by:

- avoiding excessive packaging on items you purchase;
- taking your own bags or shopping basket to reduce the use of plastic bags;
- buying your fresh food and vegetables loose;
- avoiding the use of freezer bags in your supermarket;
- avoiding pre-packaged fresh foods;
- cutting packaging – buy in bulk;
- buying concentrated products; and
- only buying things that you need.

Contribute to cleaner waterways by:

- preventing pollutants including soil, leaves, detergents, litter and animal faeces from washing into stormwater drains;
- protecting trees and other vegetation along local waterways (and planting more);
- encouraging the protection of local wetlands as these act as natural filters for pollutants, as well as providing habitat for birds and aquatic life; and
- recycling products and their packaging.

Planting mangroves to help stabilise eroding banks of the Shoalhaven River, source: SRCMA, (Peter Pigott)

Case Study: 4. Shoalhaven River Fishing Industry

Why is the Shoalhaven River Seafood Industry Important?

The Shoalhaven River supports a large concentration of commercial fishers that produce high quality seafood for domestic and export markets. The seafood industry makes a large contribution to the local economy directly through the sale of product and indirectly through employment and benefits to seafood retailers, seafood restaurants etc. The estimated value of the seafood industry in the Shoalhaven area is $25 million annually.

Local fish and chip shop at Greenwell Point, source: OceanWatch Australia

The broader socio-economic benefits provided by the seafood industry to the community cannot be understated, with fishers and oyster farmers spending an estimated 90 percent of their income in the area, allowing flow on effects to many local businesses. Furthermore, consumption of seafood has been shown to have many health benefits such as a reduction in heart disease and mental illness.

Quality seafood is a great bonus to the Shoalhaven region – it not only helps feed the local population but also attracts large numbers of tourists. Non-fishers and non oyster farmers can obtain quality fresh seafood by visiting local fish co-operatives, fish shops and oyster retailers.

Why is a Healthy, Sustainably Used Shoalhaven Catchment Important to the Local Fishing and Oyster Industries?

As with all river systems, the productivity of the Shoalhaven River is very closely linked to the health of the estuary and the state of the surrounding catchment and the habitat contained within it, both terrestrial and aquatic.

Oyster retailers are plentiful in the Shoalhaven, source: Sue Field, GTANSW

Commercial fishers and oyster farmers spend extended periods on the water and have an intimate understanding of the environment in which they work, and in many cases, knowledge that has been passed down through generations of fishing and oyster growing families.

Since fishers and oyster farmers are dependent on the health of the river system for a viable and sustainable livelihood, no other individuals have a greater vested interest in the health of these systems and are often the driving force behind advising government authorities about questionable development or habitat destruction.

The Oyster Industry

Oyster growing is a major part of the Shoalhaven seafood industry. There are about 150 oyster leases in the Shoalhaven estuary and about 40 growers. Total oyster production in the Shoalhaven estuary in 2005-06 was 165,000 dozens, fetching $850,000.

Oyster growing in the Shoalhaven River, source: Lyn DeSoto, Shoalhaven oyster farmer

What are the Main Fishing Methods Used by Commercial Fishers in the Shoalhaven?

Commercial fishing boat, Greenwell Point, source: OceanWatch Australia

The majority of commercial fishing in the Shoalhaven is conducted under an Estuary General Endorsement with fishers using a wide range of methods to suit seasonal fluctuations, locations fished and the species targeted. Each commercial fishing license carries special endorsements which dictate the methods and gear fishers are allowed to use. Fishers pay a large annual fee to the Department of Primary Industries for their licences which entitle them to target species for commercial sale.

The main Fishery of the Shoalhaven is:

- Estuary – general – this is a general fishing licence that permits within estuary fishing by a number of methods including purse seine nets, gill nets and traps for a variety of species including bream, mullet, luderick, flathead, whiting, as well as crabs.

Other fisheries that occur on beaches and ocean waters east of the Shoalhaven are:

- Ocean haul – this is a type of fishing where fishers target specific coastal species that congregate in coastal 'gutters' or migrate at certain times of the year in near shore locations that make it feasible to take advantage of the species behaviour patterns. The species commonly harvested by this method are sea mullet. The mullet are harvested in particular as an export product to Japan.
- Ocean trap and line. – the methods used under this licence type include line fishing using multiple hook rigs for both demersal and pelagic species or using traps. Species harvested by trapping in the Shoalhaven generally include snapper and other mixed reef species. Line fishing is targeted at a variety of species including both pelagic and demersal species such as tuna.
- Ocean trawl – the ocean trawl fishery is divided into two sectors that include prawns and fish. It is further divided into northern and southern areas of the state. The ocean trawl fish is a sector that operates in the south only but the ocean trawl prawn sector (inshore) operates from the Queensland border south

The main seafood species targeted by the Shoalhaven commercial fishing industry are sea mullet, luderick, whiting, mulloway, bream and school prawns. Between 105,000 kg and about 140,000 kg is caught annually by the local commercial fishers with an estimated catch value of $500,000 each year.

Some of the fishers, who are licensed to operate in the above fisheries, may have approvals or endorsements for lobster trapping. Lobster harvesting in the Shoalhaven is significant but is generally more common south of Jervis Bay.

Many of the south coast estuaries have been closed to commercial fishing – the Shoalhaven estuary is one of the few estuaries where recreational and commercial fishing still coexists.


Commercial fishing boats, Greenwell Point, source: OceanWatch Australia

How are these Fisheries of the Shoalhaven Regulated?

Each of the Shoalhaven River Fisheries is regulated by the NSW Department of Primary Industries (DPI) Fishing and Aquaculture division. Each fishery has a number of complicated conditions that restrict the areas that can be fished, the equipment that can be used, the size of the boat, the timing or season during which the fishing can occur and quotas on the catch (number of or weight of fish that can be caught).

Each fisher is required to fill in log books to record where they are fished, the species and the quality caught. This information provides vital data to researchers and managers about stock levels and provides a good indication about the health of the waterway.

What are Some of the Internal Issues of the Fishing Industry?

These include:

- a closure or restriction of the areas on the NSW south coast able to be fished that has resulted in an increased effort in the Shoalhaven area;
- need to re-organise the way fishing operates and how it is regulated;
- need to reduce the number of fishers within each fishery;
- an aging industry (mainly older fishers, with younger fishers taking their place);
- lack of encouragement for younger people to come into commercial fishing (costs and uncertainty); and
- removal of latent capacity/effort removed i.e. to remove licences which exist but are not being used.

All these areas have been addressed in proposed changes and submissions to the regulatory authority (NSW DPI Fishing and Aquaculture) but as yet have not been addressed by government.

What are the external factors affecting the fishing and oyster growing industries?

The major factors external to the industry itself that affect the fishing/seafood industry in the Shoalhaven relate to water quality issues that are generally the result of inappropriate or unsustainable landuse practices on industrial, agricultural and urban lands of the Shoalhaven River catchment. Moreover, the loss or degradation of fishery nursery habitats including wetlands such as mangrove and saltmarsh areas as well as seagrass beds, affects the productivity of the Shoalhaven River fisheries.

Cow standing in saltmarsh, potentially polluting estuary with its waste, source: SRCMA

The Shoalhaven oyster growing industry is particularly vulnerable to the impacts of water quality in the catchment. Some of the concerns of the local oyster industry include:

- being unable to harvest oysters due to high levels of faecal coliforms (originating from animal wastes) in the estuary;
- impacts of discharges or spills that affect water quality (e.g. boats, sewage systems);
- stormwater discharges from adjacent urban areas during periods of wet weather; and
- increase in recreational boating pressure adjacent to oyster leases that increases the risk of contamination.

General factors that may impact on commercial fishing in the Shoalhaven estuary include:

- barriers to fish migration by floodgates, weirs and other structures (see fact sheet on Land and Water Management Issues in the Lower Shoalhaven River Catchment);
- drainage of wetlands and other parts of the Shoalhaven River floodplain;
- acid water entering the estuary from disturbance of Acid sulfate soils (see fact sheet on Land and Water Management Issues in the Lower Shoalhaven River Catchment);
- changes in the balance between mangrove and saltmarsh habitat;
- impacts of upstream water extractions on flows into the estuary that can influence salinity levels particularly during times of low flow; and
- impacts of sea level rise and temperature rise (e.g. possibly more algal blooms) as a result of climate change.

Acid water, source: NSW DPI (Allan Lugg)

What are Some of the Initiatives Practiced and/or Promoted by the Fishing and Oyster Industries in the Shoalhaven?

The Shoalhaven River area has seen partnerships and programs established between the fishing industry, dairy growers, Shoalhaven City Council and other local sectors to undertake projects that aim to reverse the many years of altered estuary management and poor landuse practices which have resulted in degraded estuarine and marine ecosystems.

Partnerships and programs that are ongoing in the Shoalhaven include:

NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS) – OISAS is a NSW Government strategy that aims to recognize and protect oyster growing areas, including the Shoalhaven estuary. It also aims to improve the environmental performance of the industry and provide greater certainty for the industry.

OISAS identifies priority oyster aquaculture areas (POAAs). In these areas oyster aquaculture development is permissible without consent. A map of the Shoalhaven POAA can be found at:

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/117983/OISAS-Shoalhaven.pdf

OISAS also sets out best environmental practices for the industry.

Oyster Industry Partnerships Program – The Southern Rivers Catchment Management Authority is working with dairy farmers and oyster growers in the Shoalhaven estuary to reduce the impacts of water quality on oyster leases. Dairy farmers that have properties adjacent to the oyster leases have been assisted by the CMA to attempt to minimise the impacts of unrestricted cattle access on the River. Some 20 kilometres of foreshore have been fenced to exclude cattle. As a result, the number of days the River has been closed for oyster harvesting due to high faecal coliform levels has been significantly reduced. The program has also strengthened the relationship between the local dairy farmers and oyster growers.

Greencorps team helping landowners fence cattle out of the Shoalhaven River: source SRCMA

This program also incudes initiatives such as cleaning up derelict oyster leases (see fact sheet on *Waste Management in the Lower Shoalhaven River Catchment*).

The success of this project stems on the successful partnerships formed, not only between the SRCMA, diary farmers and oyster growers, however with others such as NSW DPI, Conservation Volunteers Australia, Job Futures Green Corps and Shoalhaven Riverwatch.

For further information see http://www.southern.cma.nsw.gov.au/pdf/ShoalhavenRiverCaseStudy1.pdf

A joint project between four dairy farmers in the Crookhaven catchment near Nowra is supporting downstream oyster growers in the protection of local waterways.

The Agriculture Today (October 2005) reports dairy farmers' efforts are making a big difference to both the water quality and to oyster harvesting in the catchment.

According to Southern Rivers Catchment Management Authority (CMA) landscape manager, Chris Presland, mangroves are already regenerating where fencing has been constructed.

One property now has three kilometres of fencing, excluding 100 head of cattle from the catchment.

"It has long been recognised that unrestricted cattle can pollute streams and erode riverbanks," Mr Presland said.

"On many occasions oyster growers in the Crookhaven catchment have been unable to harvest due to increased faecal coliforms, detrimental to the industry."

According to Barry and Brian Allen from the Shoalhaven Oyster Service, a healthy local environment is critical for the harvest of healthy oysters.

The Allens say the work being carried out in the estuary compliments their shellfish quality assurance.

The dairy and oyster project became a collaboration between two seemingly unrelated industries in May 2004, when members of Shoalhaven Riverwatch, a local Landcare group, met oyster growers and Southern Rivers CMA.

"Southern Rivers CMA then met local dairy farmers, who quickly took on the challenge of improving the health of the water," Mr Presland said.

Funding from Southern Rivers CMA through the Australian Government's Natural Heritage Trust program and the State government has helped the dairy farmers build stock proof fencing to restrict cattle access to waterways.

Ron Graham, a local dairy farmer is very happy to be part of the project.

"It has been encouraging that dairy and oyster farmers are able to get together," Mr Graham said.

Eventually more than 10km of stock proof fencing will be completed.

Southern Rivers CMA currently has funding from the Australian Government's Natural Heritage Trust for on-farm projects that improve farm productivity and the health of South Coast waterways.

Some of the eligible works include fencing to exclude cattle, the provision of off-stream watering, riverbank erosion control and revegetation.

Farmers have also received financial assistance to install and upgrade effluent management systems, plant shelter belts and windbreaks, remove weeds and some cases, improve laneways.

Additional support was secured from Greencorp and Conservation Volunteers Australia (CVA) who provided hands on help and assisted farmers with fencing.

http://www.dpi.nsw.gov.au/archive/agriculture-today-stories/agriculture_today_october_2005