



Blue Swimmer

Newsletter of the Friends of Gulf St Vincent

Issue 18, November 2010

President's Message

What a wonderful way to spend a sunny day—by visiting the recently completed second stage of the Torrens River Wetland on Breakout Creek between Henley Beach and Tapleys Hill Roads. It is well worth a visit.

It is an absolute joy to walk along the Linear Park and take in the ambience of this landscape, with frogs croaking, numerous plant species jumping out of the ground and birds species not seen along this part of the Torrens for 40 years or more.

These wetlands created some concern when first considered by the community over 8 years ago, with fears about flooding, mosquitoes and of course the horses that have roamed the banks for many years.

Engineering soon resolved the fears of flooding, the return of the water critters has kept the mossies under control and the horses were moved further to the south away to keep them from causing damage.

At a recent celebration for the completion of the second stage it was great to see the transformation from a filthy creek and drain to a vibrant and healthy wetland.

There is no doubting the environmental benefits of these wetlands with improved water quality, flora and biodiversity.

There is only one section left to develop—between Tapleys Hill road and Gulf St Vincent, and the local Residents Association is keen to get this happening.

Letters have been sent to the AMLRNRMB requesting that they start engaging with the community to plan the final stage and to investigate alternative agistment for the horses.

The Adelaide Coastal Waters Study showed conclusively that sediments and high nutrient loads are primarily responsible for killing off our

seagrasses. Part of the answer is to clean up the river and stormwater system and stop wastewaters entering the Gulf. These wetlands are a great beginning.

Doing the right thing at the beach...

As summer draws near, and our beaches fill with swimmers or walkers, it is a good time to remember that there are beach-related regulations designed to keep our coast and its users safe.

I think most people would agree that we all have a responsibility to ensure the beaches and Gulf are looked after.

Over summer there are restrictions on the times dog owners may let their pets run without a leash, and owners must remove dog poo from the beach.

Alcohol consumption is regulated on the beach to keep this environment safe for families and reduce the risk of fights and accidents.

Our Surf Lifesaving Clubs do a great job patrolling the beaches to keep an eye on swimmers and other water users.

Fishing is a popular recreational activity for families, but in the light of recent shark captures, it is worth reminding anglers that it is illegal to use blood, bone, meat, offal or the skin of animals or birds as bait or berley in SA marine waters.

Finally jet skis—don't get me started! Unlike most other activities at the beach, jet skis are noisy, intrusive, and generally seem to be pretty pointless. What would be really great is to have some clear rules around where they can be used, so they are kept well clear of swimmers.

If we see people doing the 'wrong thing' over summer, it might be worth a gentle reminder if you are game, or an email to your local member!

Jim Douglas



“Water Quality—Why it Matters” Forum Sunday 26th September 2010 at the Semaphore Surf Lifesaving Club

President Jim Douglas opened the Forum at 10.30 by acknowledging that we were meeting on Kurna land.

The Forum was opened by the SA Minister for Environment and Conservation, Water and the River Murray, Paul Caica. Minister Caica is a local resident who grew up in and around Henley Beach.

The Gulf supports a range of economic and recreational activities.

As a long term beach user he is aware of the impacts on the Gulf over the past 50 or so years, particularly the loss of seagrasses.

The Minister gave an example of the differences in perception of what is normal or good between generations – his son regards snorkelling over clean sand as normal and pleasing, while at his age Paul would snorkel over seagrass beds between the Grange and Henley jetties .

The Minister’s door is always open to community groups, industry, anyone, because dialogue with all stakeholders is essential for cooperation. He is happy to be the Minister for Environment and all aspects of water. Collaboration is essential to get sustainability.

In 2001 the EPA established the Adelaide Coastal Waters Study in response to concerns about water quality in the Gulf. The ACW quality improvement plan will address recommendations of the ACWS. The AMLR NRM Board’s work in the area of stormwater is acknowledged.

The Commonwealth govt contributed \$65M and the State govt \$45M with other significant contributions.

The initial goal is to capture 18 – 20 gigalitres (GL) of water and the Water for Good plan aims for 65% by 2050.

There are 53 outlets to the coast, and the recent rains deposited heaps of rubbish onto our

beaches, showing that trash racks are far less effective when the rain is that heavy.

One of the factors currently being investigated is the economics of water pricing.

The Minister has made a commitment to progress the issues raised with him in a meeting with the Friends’ delegation in August.

Issues specifically occupying the Minister at the moment are:

NRM reform – mentioned in the context that one of the main goals is to integrate resource management, and to maximise the relationships between the Department, the NRM Boards and the community.

MDBA plan – will be delivered soon.

Drought – whilst it is over for now, the consequences aren’t – things will not go back to “normal”. The system still needs to be managed. River banks are slumping and the regulators were installed to help manage risk.

The Minister congratulated the Friends on the Secchi Project, and praised the contribution of Pat Harbison and Ian Kirkegaard, – our first two life members.

The SA Government is committed to a sustainable future – the Gulf IS a wonderful asset that needs to be protected.

Questions from the audience related to concerns about the announced cuts to government staff in the Minister’s portfolios and the perceived incongruity between our current concerns about water supply and the population target of \$2M for Adelaide.

The Minister flagged the need for a shift in thinking about source waters, pricing regimes and third party access.



Minister Paul Caica opening the Friend’s Forum
Photo taken by John Caldecott

The desalination plant is regarded as the State's insurance against running out of water for critical human needs.

Clearly things will not change quickly enough for some people.



Anthony Cheshire—Science to Manage Uncertainty

Sea change: Climate and Population Challenges in the Management of Coastal Ecosystems

Managing our beaches is a challenge – but not insurmountable!

A recently completed survey of marine debris suggests that most comes from human activity on land.

Marine ecosystems are as productive as land – producing 20kg of wet weight per square metre per year. **Coastal ecosystems in SA are unique**, with 3-5 times as many macroalga species as corals in the Great Barrier Reef. We have the highest biodiversity for a temperate region anywhere in the world, and 60-90% of our species aren't found anywhere else.

Our coastal ecosystems are under **threat** from waste water discharge, storm water, industrial discharge, coastal development, fisheries (whilst it is acknowledged that fisheries are managed, it is debatable if it is always effectively), agricultural activity, pest plants and animals (exotic marine worms, weeds, crabs).

The main **risks** to coastal ecosystems come from urbanisation, industrial development, agricultural runoff, aquaculture, fishing, pest plants and animals, recreational use and climate change. Is the risk for SA more or less than elsewhere? Clearly it is not as threatened as many places in the world, but is more so due to the unique biota and environment. It is an oligotrophic environment – very low in nutrients – our natural nutrient levels are less than one tenth of other temperate systems. Those environments are better able to deal with nutrient influx, but ours are less able to cope.

Nitrogen is a serious problem. The gulf waters may look fine from the surface, because the effects of excess nitrogen and the problems it causes are hidden from view, except when algal blooms are evident.

The potential of aquaculture in SA is limited by naturally low levels of nutrients.

Condition of the Adelaide Metropolitan coast

Reef Watch started in SA (with the support of the Conservation Council) in recognition of stress on coastal reefs along the coast.

The initial study, which was funded by the EPA, looked at a series of reefs between Semaphore and Aldinga (1996-1999). The results were informative, with the southern reefs in pretty good condition, the central reefs (around Hallett Cove) showing signs of stress, and the northern reefs in poor condition.

In 2000 a bigger study began, involving other agencies. In 2006 not much had improved. Furthermore, Victor Harbor now shows significant evidence of impact from urban development.

Seagrasses

Mapping has shown that we have lost 6,000 ha in 50 years, with clear patterns of loss associated with wastewater pipes – particularly at Semaphore. Recent studies have been made using the isotope delta 15 Nitrogen – which is terrestrial in origin. Graphs show that there is clear correlation of N from land in marine plants. Even though the sources of the input are from specific points, currents are distributing the nutrients along the coast.

Population increases are driving expansion in urban and industrial development and at the same time increasing turbidity, lowering light levels and affecting water quality. This all contributes to loss of seagrasses.

Historical records show that in 1920 the population was 200,000 and in 2000 it had reached 1,000,000. The State government's Strategic Plan is to double the population by 2030. There is no reason to expect – if we keep causing the same amounts of pollution – that there will be any change in the outcome!

What should we do differently in future?

Key threats in the Adelaide and Mt Lofty Ranges:

- Stormwater
 - ◆ Turbidity and suspended sediments
 - ◆ Nutrients
- Wastewater and industrial effluent
 - ◆ Nutrients – particularly Nitrogen
 - ◆ SA Water treats 95GL of wastewater per year
 - ◆ *This wastewater from homes and businesses is generally 99.9% water, with the remaining 0.1% made up of dissolved or suspended waste material*
- All issues are associated with coastal development and population size

➤ CLIMATE CHANGE

Bureau of Meteorology trends over the past 40 years show both increasing temperatures and decreasing rainfall

Future Scenarios

If we do nothing, Adelaide’s population will grow to 2 million, urbanisation will increase, volumes of wastewater will increase. The existing upgrade strategy cannot cope with the predicted population size. Increased volumes of stormwater will result from higher urban infill and discharge will be of poorer quality.

All this will mean ongoing loss of seagrasses and reef degradation

An alternate vision is proposed - requiring policy, planning and implementation.

The main elements are:

- Zero discharge of waste to the marine environment by 2015
 - ◆ Manage stormwater quality
 - ◇ Shift policy focus to reuse, not just flood mitigation
 - ◇ In-stream wetlands to manage sedimentation and nutrient removal
 - ◇ Aquifer storage and recovery
 - ◆ Stop industrial and wastewater discharge to Gulf
 - ◇ Reuse and ASR
- Urban development plans
 - ◆ Limit coastal development
 - ◆ Water sensitive urban design
 - ◆ Zero discharge from development
 - ◆ Use stormwater at source
- Marine planning and protected areas
 - ◆ To provide adequate protection for habitats and resources

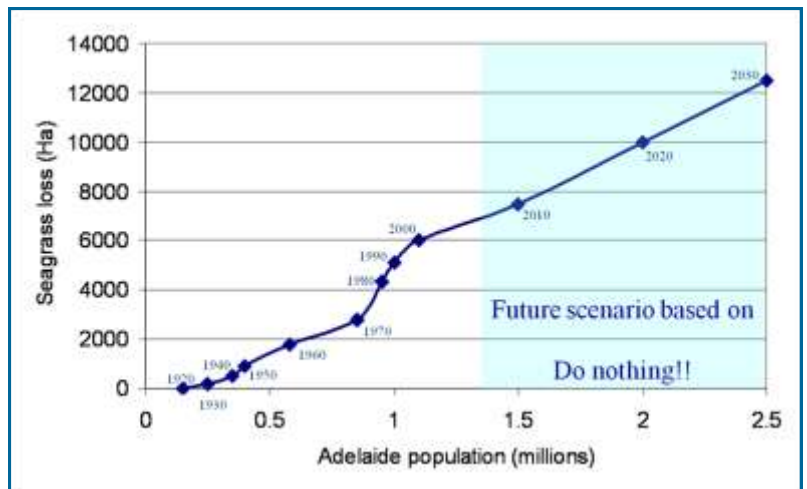
The Alternative vision – Seagrass 2020

No further loss, limited potential for natural recovery and may be opportunities for rehabilitation – SAVE THE NORTH AND SOUTH!

Actions for Change

- State Strategic Plan must
 - ◆ Balance economic and social development with ecological and environmental values
 - ◆ Recognise that population and economic development targets, if taken alone, will compromise environmental values

- Fundamental review needed of planning and development policy for Adelaide Metropolitan region
 - ◆ Develop risk based approach to prioritising NRM actions
 - ◆ Supported by monitoring
 - ◆ Safety net for ‘no risk’
- Research and monitoring are essential to frame:
 - ◆ risk assessment
 - ◆ monitoring targets and strategies
- ◆ program logic around key management actions



Source: Anthony Cheshire presentation

In summary, our coastal waters are a valuable asset to SA, providing ecosystems and services worth over \$1 billion annually. The State Strategic Plan must provide a framework for sustainable development in the Adelaide region and that explicitly recognises and balances economic, social and environmental objectives.



Peter Pfennig—EPA

Adelaide’s blue line has disappeared in the past 30 years, along with 30-40 cms of sand. Algae are growing on the exposed calcrete – the ‘bottom’ has changed.

The community is concerned about poor water quality, sand movement and seagrass loss.

The Adelaide Coastal Waters Study (2001-2007) covered the coastline from Port Gawler to Sellicks Beach. The objectives were new knowledge and tools for sustainable management. The focus was seagrass loss, sea floor changes and water quality.

The findings from the ACWS indicate that nutrient rich inputs from sewage treatment plants and industrial discharges, and suspended solids and coloured dissolved organic material from storm-water are the main causes for loss of seagrasses along the Adelaide coastline.

The major impacts of nutrients are eutrophication (excess nutrients) causing growth of epiphytes, depletion of oxygen and reduced light penetration. Suspended solids and colour reduce light and smother.

The draft **Adelaide Coastal Water Quality Implementation Plan** (ACWQIP) recommends a strategy to achieve water quality that meets community expectations.

- Takes in new information/understanding provided by research including ACWS
- Includes input from Adelaide community to develop environmental values
- Water quality objectives were developed with input from stakeholders and community
- Agreed strategies for implementation of ACWS recommendations

The role of EPA is to:

- Lead development of ACWQIP
- Legislative power to manage water quality
- Find solutions
- Commit to sustained outcomes, not just report

Why has it taken so long?

- The aim is to build assured workable outcomes
- Stakeholders are taking this seriously and required time to ensure that commitments in the ACWQIP are real and will be met

The process is almost complete and a draft plan will be released for comment – hopefully before the end of the year

EPA and other stakeholders have not been idle!

In the meantime:

- SA Water's Glenelg to Adelaide Parklands reuse scheme is operating
- SA Water has commenced the redevelopment of the Christies Beach Wastewater Treatment Plant to achieve ACWS targets
- Penrice Soda has completed the first part of its environmental improvement plans – to reduce its N output from 1,000 tons to 575

tons. They have applied to the Feds for support for R&D to reduce N even further.

- AMLR NRM Board plan has incorporated ACWS recommendations
- Extensive development of stormwater reuse projects
- EPA has started filling in gaps

Some ACWS-related EPA activities

- aquifer environmental values to ensure sustainable re-use of water
- Peer-reviewed, revised Coastal Waters Monitoring Program,
- Investigate metals and pharmaceuticals in coastal waters,
- Enlarged Nitrogen isotope survey of Adelaide coast and proving of methodology for long-term monitoring
- Suspended solids and colour catchment/near shore linkage monitoring – modelling to support AMLRNRM Board
- Embedding of ACWS outcomes in key strategic documents – e.g. 30 year plan
- Developing license arrangements to ensure nutrient reductions by Penrice and SA Water
- Revision of Dredging Guidelines (for 2012)



Epiphytes growing on seagrasses
Source: Peter Pfennig presentation

Nutrient loads will be reduced through environmental improvement plans, wastewater treatment plant upgrades and wastewater and stormwater reuse.

Sediment loads will be reduced through vigilance by AMLR NRM Board, Local councils and water sensitive urban design.

The draft ACWIP will be released asap and EPA will be seeking wide feedback. Keen to provide opportunity to discuss the plan with the Friends.



David Cunliffe – Principal Water Quality Adviser, SA Health
Drinking Water and Recycled Water Safety

In Australia, drinking water safety is governed by a national set of guidelines – the **Australian Drinking Water Guidelines**. New guidelines are being prepared that deal with drinking water, recycled water and rainwater. Their common theme is preventive risk management to assure quality before use.

The focus for the Dept of Health and water providers is on understanding the important risks, and designing a system that **SHOULD** work and then operating it so that it **DOES** work effectively. The aim is to reduce reliance on water testing at the point of use – where there is a problem there it is too late.

Guidelines for water quality apply to recreation waters, drinking water and rainwater.

Drinking Water Framework

This framework is used by water providers to assess how to responsibly manage and use their resources. It includes a number of elements relating to:

- Source water assessment
- Intended use, eg, municipal watering, agriculture etc
- Identification of the major hazards
- Identification of the appropriate preventative measures
- Monitoring steps to ensure preventive measures are effective
- Compliance testing

Water providers such as SA Water undertake 24 hour /7 day monitoring and incident and compliance management.

Drinking Water

Producing drinking water is difficult – it has to be safe all of the time. Relatively small contaminations can have disastrous and expensive consequences.

- In 1993, heavy rain and poor performance of a filtration plant resulted in 403,000 gastrointestinal (GI) cases in Milwaukee (US)
- In 2000, contaminated groundwater in Walkerton Canada resulted in 7 deaths and

2000 GI cases

- In 1998 in Sydney, contamination of the water supply led to 3 boil water notices and cost an estimated \$75-350M.

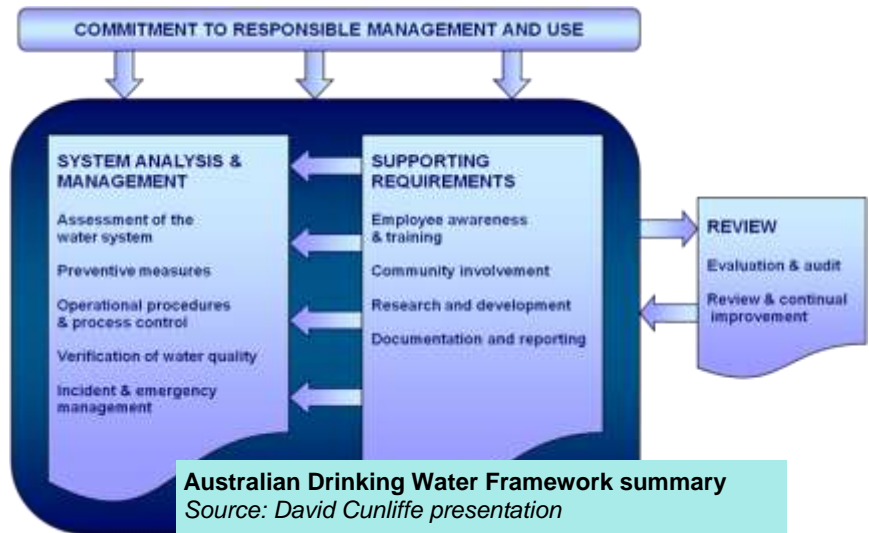
SA Water spends large amounts of time and expertise to maintain drinking water quality

How do we know it's safe? By implementing the Australian Guidelines for Drinking Water Quality and applying the principles in the draft SA Safe Drinking Water Bill.

Alternative Water Sources

Use of alternative water sources makes the task more difficult.

- Sewage – worst quality, and everyone knows it is unsafe
- Greywater – variable quality and can contain unexpectedly high numbers of microorganisms, detergents, chemicals from personal care products
- Stormwater – large volumes, but collection and storage are challenging. Water quality is extremely variable
- Rainwater – relatively high quality and low risk
- Desalinated water – very high quality, most risks are due to softness of water and compatibility with existing mainswater



The **Australian Guidelines for Water Recycling** don't advocate particular uses. Decisions about how recycled water is used is up to individual jurisdictions and communities.

Phase 1 (Nov 2006) covers use of treated sewage and grey water for residential (non-potable); urban recreational and open space irrigation; gardens, golf courses and sports grounds; agricultural and industrial use

Phase 2 (May 2008-09) covers use of recycled water for drinking water augmentation, managed aquifer recharge and stormwater recycling

New guidelines will address the health aspects.

- Include a focus on application of a risk management framework that, if applied, will ensure the safety of recycled water systems.
- The definition of safety (for microbial risk) is less than one diarrheal illness per 1000 people per year.
- Targets for bacteria, protozoa and viruses (and how to calculate them)
- How to achieve safety using preventive measures (treatment and on-site controls)
- Tables of typical schemes and safe uses.

Relative risk

Safety is important – causing damage with alternative water sources doesn't make sense. Public health is paramount.

All types of recycled water can be used safely providing adequate controls are applied for the chosen end use and schemes are operated and managed responsibly.

Control measures may include treatment (to reduce pathogen load) or reduce exposure.

Health risk is calculated from hazard concentration x exposure. A significant hazard from alternative water sources are the pathogens that can cause serious illnesses in humans.

Reference pathogens most commonly used in Australia are:

Campylobacter (most common cause of GI illness)

enteric viruses/rotavirus (enteric viruses are numerous and rotavirus is a common cause of illness in children)

Cryptosporidium which originates from animals (such as cows and dogs).

Australian sewage contains, on average, 2000 *Cryptosporidium*, 8000 enteric viruses and 7000 *Campylobacter* per litre. Stormwater contains about 1.8 *Cryptosporidium*, 1 enteric virus and 15 *Campylobacter* per litre.

Grey water contains 0.1 – 10% of pathogens in sewage, depending on inputs.

Safety is achieved if people are exposed to less than 0.002 viruses, 0.02 *Cryptosporidium* and 0.04 *Campylobacter* (= to risk of <1 diarrhoeal illness per 1000 people per year).

Water and wastewater treatment process must be able to reliably reduce the levels of these

organisms, and different treatments have different levels of effectiveness. Many combinations are possible depending on what end purpose is intended.

Types of **treatments** used include lagoons/wetlands, chlorination, UV light, coagulation/sedimentation/filtration, membrane filtration.

Exposure reduction measures include using drip rather than spray irrigation, subsurface irrigation, buffer zones, withholding periods, restricting public access.

Stormwater

Stormwater is highly variable, and may contain from 10 – 900,000 *E coli* per 100 mL.

- The risk from viruses and protozoa can be greatly reduced by providing protection against sewage and livestock waste, which are the primary source of pathogenic viruses and protozoa.
- Harmful bacteria (eg *Salmonella* and *Campylobacter*) are the main concern with birds and other small animals.
- Chemical hazards from industrial, commercial and domestic disposal include road grime, oils and greases – and pose acute risks
- First flush events can produce extreme physical and microbiological contamination

Pathogen reductions required for stormwater are generally lower and the guidelines identify appropriate controls.

Recreational Waters

The focus is on assessing risks based on sources of contamination and the microbial water quality (levels of *E coli*). The most likely sources are human sewage and livestock.

Beaches and recreational waters – West Lakes and the Patawalonga are usually OK, with low numbers of *E coli*, and low inflow of human and livestock waste.

One problem is immediately after rain (particularly summer storms). The message is to avoid contact with discoloured water after rain events (eg 2-3 days in water bodies such as West Lakes and the Patawalonga).

Permanent signs at West Lakes, Patawalonga, major drains and Torrens outlet warn people to keep out of storm water.

In Summary

- All water needs to be treated with respect. Recycling is great, but must be undertaken in a safe and sustainable manner

- From a public health perspective our marine waters are generally high quality
- SA is a leader in using treated sewage
- Stormwater projects are underway at Salisbury, Mawson Lakes, Lochiel Park, Morphettville, Tea Tree Gully etc.
- 50% of Adelaide households have rainwater tanks

in 2007, 54% of SA households used grey water – equal to the national average (Vic and ACT are higher and WA is lower).



Sue Murray Jones—DEH

Water Quality and its Impacts on Reefs

What is a healthy reef?

Health is assessed against the normal or 'baseline' state – but beware of shifting baselines! Symptoms of decline in health may include:

- a shift to smaller organisms
- change in species, eg fewer grazers may lead to algal overgrowth
- reduced diversity
- increased dominance of weeds/exotics
- shorter food chain lengths
- altered energy flows and nutrient cycling
- more disease
- less stability

Threats include:

- turbidity and sediment
- salinity
- nutrients
- toxicants
- extractive activities such as fishing and exploration

Reef Health assessments carried out in metropolitan Adelaide

- 1996, 1999 led by Cheshire and EPA funded (due to dredging impacts at Noarlunga)
- 2005 – 2007 Reef Health Project, funded by FRDC

An amazing amount of cash and in kind support was available from EPA, DENR, SA water, Reef Watch etc.

Methods used include line intercept transects, quadrats, fish surveys, topography, invasive species – present or absent.

Indices for reef condition are canopy macroalgae, turfing macroalgae, cover of mussels, bare substrate, site-attached fish, mobile predators, wrasse, invasive species, level of sedimentation, richness of algae and mobile invertebrate species.

Reefs in the north near Port Adelaide are trashed.

Conclusions from the Reef Health survey:

- North/South gradient continues
- There has been decline on central reefs
- There are concerns with Noarlunga Reef
- Southern reefs are OK

Further monitoring of certain sites is required

Community Monitoring

- Comparable to Reef Health Surveys
- Comparable data sets
- Appropriate training is important
- Less certainty about species id

2009-10 Reef Watch surveys found evidence of decline in status at Hallett Cove, demonstrating the effectiveness of the program for early warning of problems.

Sliding baselines – Sean Connell used historical sources to estimate previous cover. SA metro reefs originally had cover similar to other places – outside metro and WA. There has been up to 70% loss of canopy-forming algae on metro reefs since urbanisation.

SA has high biodiversity with 12-14+ species of seagrasses spread over 5000 square kms, and Adelaide originally had extensive seagrass beds.

5200 hectares have been lost in last 50 years – mostly *Amphibolus* also *Posidonia*. The loss correlates very well with effluent and stormwater discharge and population growth.

Seagrasses are vulnerable

Erosional scarps formed as seagrasses are lost are fast moving.

Seagrasses are generally slow growing – scars from seismic tests in Spencer Gulf 50 years ago are still visible. Seagrasses shape their environment – once the sediment is unconsolidated there is usually no recolonisation. The correlation between population density and seagrass loss over time is strong.

Why have they been lost?

Possible stressors include pollutants, decreased salinity, poor light and eutrophication.

Pollutants? - NO Water has been tested in 8 sites for a range of biocides including

organochlorins, organophosphates, triazine and glyphosate – all below limit of detection. Also tested sediments for the same chemicals plus hydrocarbons and heavy metals. Heavy metals were detected in some locations.

Salinity? - NO Mature *Posidonia* and *Amphibolus* are not affected by short term reductions in salinity, and it took 7 weeks in salinity of less than 1ppt to kill seagrass. Seedlings/seeds are stressed or killed by less than 10ppt – but such levels are extremely low and very unlikely.

Light? – MAYBE Seagrasses need a relatively high proportion of surface irradiance, and need more light than algae. There has been much experimentation into light. A light shock experiment was carried out to reduce light over an area of seagrass by 99% for 6 weeks. There was some decline, but not complete. Sedimentation of reefs is damaging, but maybe not so much with seagrasses. Light unlikely to be the primary factor in seagrass loss.

Nutrients? – YES

Excess nutrients is the most widely reported cause of seagrass loss. Nutrients encourage growth of epiphytes, which block light absorption, gas exchange and nutrient uptake. High nutrient levels can have a direct toxic effect. An experiment was carried out adding osmocote to both *Posidonia* and *Amphibolus* and there were very dramatic effects within one year.



Seagrass seeds germinating
Source: Sue Murray-Jones presentation

Conclusions

- There has been massive loss of *Amphibolus* off Adelaide
- Experiments showed *Amphibolus* and *Posidonia* are highly sensitive to excess dissolved nutrients
- A and P seem to be resilient to light starvation
- A is not recovering naturally off Adelaide, but P is in places

What can we do?

- Improve water quality
- Protect what's left (Marine parks)
- Monitor condition (AMLRNRM/DENR/SARDI)
- Restore it

Over the past 8 yrs many methods have been trialled for re-establishing - \$800k funding. Seedlings have been deliberately planted. Best method seems to be recruitment of natural seedlings. Causes of seedling loss include bag failure, which is a materials science failure.

Better Bags project may help. Physics department was interested, and a grant was received from Flinders Uni. They developed a treatment using a nanotechnology approach. The material is biodegradable, but will last as long as needed. Field trials are underway. The project has been funded by the Australian Research Council, SA Water and AMLNRM.

EPA monitors the blue line every few years. Beachport is also being impacted by drains in the southeast – there has been significant seagrass lost.



Richard Clark - Former Chair, Stormwater Industry Association

Institutional barriers are a problem and water is far from a simple commodity. 20 years ago Richard worked for E&WS – when environmentally sustainable development was introduced. E&WS was faced with infrastructure replacement, which was likely to result in an increase in water prices. Problems were beginning to occur in the River Murray and the Gulf. Richard wrote an article for the Australian Water Association, suggesting a different way of water budgeting – how much should be stored. It concluded that Adelaide could be self sufficient if wastewater etc was recycled. A Monash university group was also convinced that a diverse portfolio of water sources was the way to go.

The majority of water professionals are more environmentally aware than water organisations and politicians. There is no vision to change and the hierarchy is reluctant to change the status quo.

Progress has been in fits and starts. NRM Boards have been a great success. State governments haven't done very much and changes have been in narrow areas of focus. Sustainable cities, transport, energy are interlinked but don't

necessarily communicate very well.

Monash University's survey found that the water industry doesn't have a vision of urban water sustainability. It seems silly not to recognise that

1. you don't want to pollute water in the first place
2. having cleaned it – reuse it

Building developments have been established on floodplains.

We need a blueprint for a sustainable vision. It would include:

- Good reliable water supply
- City not subject to flooding
- Reduce impact at bottom end
- Reduce environmental impact at top end

Technologies would include composting toilets

Water for Good did not look at water system layout other than what is already in place. New sources – yes.

It is critical to know storage capacity of aquifers.



Cath Kemper—SA Museum **Marine Mammals and Pollution in SA**

Marine Mammals that are found in the Gulf include cetaceans - baleen and toothed whales and pinnipeds - eared and true seals.

Baleen whales (Southern Right whales, Minke whales) are filter feeders that eat plankton and small fish, live 50-100 years and are mostly found in the open ocean. Toothed whales (eg killer and pilot whales) eat fish, squid, octopus, birds and mammals, live 20-100 years and are generally found in the open ocean and on the continental shelf.

Pinnipeds (Australian Sea Lions, NZ Fur Seals) eat fish, squid, octopus and birds, live 20-30 years and are found in open ocean and on the continental shelf.

The length an animal lives, its diet and habitat all affect the risks to their health.

Diet is difficult to study – hard parts can be identified, and a number of researchers are now expert at assessing diet of marine mammals.

Marine mammals that have been recorded in the GSV bioregion are:

- 7 species of baleen whale, with 2 species seen regularly

- 16 species of toothed whales, with 2 resident and another 2 regular visitors
- 3 species of eared seals, with two resident
- 2 species of true seals

GSV has four resident marine mammal species – Short-beaked Common Dolphin, Indo-Pacific Bottlenose Dolphin, Australian Sea Lion and New Zealand Fur Seal (both pinnipeds have haul out sites near Adelaide).

Pollution threats to marine mammals

Immediate

- entanglements/incidental take
- ship collisions

Intermediate

- habitat degradation
- oil spills
- exposure to human diseases

Long-term

- chemicals and heavy metals
- morbillivirus outbreaks

Of all cetaceans autopsied from 1985-2000 around 60 (or 17%) of deaths were caused by entanglements.

Long term threats are much harder to measure and interpret

- long term data and samples are required
- specialist knowledge is needed in a variety of fields
- major funding is needed to assess some compounds
- it is difficult to make the link between compounds and pathological effects
- v little is known about marine mammal diseases

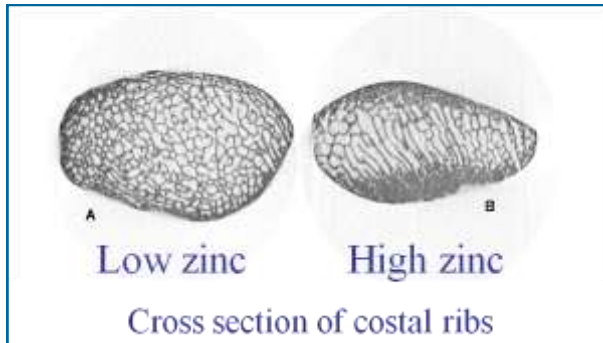
Some of the known effects of toxic contaminants on mammals are: kidney disease, bone disease and malformation, reproductive failure or reduced function, disruption of the immune system.

Heavy Metal studies have been conducted by the SA Museum and universities. Student projects began in 1991, and major contributions have been made by Martine Long and Trish Lavery who studied heavy metals in dolphins. They found some concentrations that were of concern.

Mercury levels are highest in Bottlenose dolphins, however a complication here is that Selenium cancels out most of the toxic effect of mercury. Common dolphins have lower levels of Mercury as their food source is from deeper water. The don't live as long as Bottlenose dolphins either.

Spencer Gulf has high levels of Cadmium, Zinc and Lead. GSV has high levels of Mercury, Selenium, Lead and Zinc.

Trish Lavery looked at the effects of metals on bone and kidneys. Bones in dolphins with high



Changes in bone structure due to zinc toxicity
Source: Cath Kemper presentation

zinc levels showed changed morphology – the structure was affected. (see picture below) Some also showed signs of kidney disease.

The **effects of metals on reproduction** in Bottlenose Dolphins was also investigated.

- One male dolphin from Upper Spencer Gulf with very high zinc levels (270 mg/kg) showed bone and kidney disease, and though mature, showed no reproductive function at death.
- One female from Spencer Gulf, with the highest Cadmium levels (98mg/kg) and moderately high zinc (209 mg/kg) levels, had bone and kidney disease and was not sexually mature at 13 years.
- One female from Upper Spencer Gulf had 19 ovulations by 19 years of age.

Future Research plans

- Set up 'Centre of Excellence' for studying toxic contaminants in marine mammals
- Collaboration between SA Museum and other institutions
- Any ideas?

Dolphin Trauma Group is multidisciplinary and involves SAM, DENR, PIRSA, veterinarians, Whale and Dolphin Conservation Society. Its

purpose is to carry out necropsies on dolphins (particularly in GSV), investigate causes of deaths and provide evidence to law enforcement agencies and to research the biology of dolphins. Their investigations lead to better management of marine mammals.

The Museum's Facilities at Bolivar are unique and valuable to the State. Friends are invited to visit for a tour.





More thoughts from Richard Clark

Before, during and since the meeting I have been trying to identify a strategy to actually get changes happening. On Sunday I wished to leave the audience with the message that the strategy should involve

- i) a clear vision, with common appeal, of what we wish to achieve, and
- ii) an acceptable strategy on how to get decision makers to adequately assess the vision (ie explore its implications in economic/social/environmental terms) and then, (if the vision is still seen to be beneficial), to plan to achieve the vision or its subsequent agreed modification.

The elements of the strategy seem to me to be

- form a partnership with other known like-minded organisations
- identify the vision in simple terms
- suggest a process for govt to assess the implications and costs/benefits of the vision
- broadcast the formation of the partnership and advertise for new partners and public support
- hold large public meetings until the govt is forced to take notice.

During this process natural leaders with charisma might hopefully emerge.

The starting vision which I think can grab the public notice is “the sustainable city”. It is, after all where we all live. The vision is that the sustainable city and its bio-region can be a healthy attractive LOW COST place to live and play. The vision would (possibly) identify the following processes and objectives compatible with attaining the sustainable city (to be discussed)

- Decisions on city development to be wrested from developers and more power given to ‘people power’ (eg NRMBoards, Cons Cncl, ...??)
- Population growth plans curtailed until plans and targets for environmental sustainability in place
- Unacceptable environmental by-products of present development identified and their impacts costed under different likely future scenarios of growth, climate change and planned new technologies
- Alternative plans identified to reduce environmental impacts, reduce waste, increase efficiency and reduce holistic costs

for customer services

- Research undertaken into areas of uncertainty associated with the alternative plans
- Alternative measure of societal wellbeing taking environmental costs into account adopted for Govt performance

Like-minded organisations that come to mind may be Conservation Council, Civic trust, Consumers Association, Water Industry Alliance, Stormwater Industry Assoc, Hydrological Society, ...there must be many. many others..

I think that a lot of basic data on how the sustainable city may be a lower cost place to live (the hypothesis to be examined) could be gleaned from members of these organisations, members of the public, uni students, educators, entrepreneurs, scientists, even economists.



Reef Watch Feral or In Peril Program launches Boat Owners Guide.

The Conservation Council of SA citizen science program **Feral or In Peril** encourages divers, fishers and boaters to report sightings of both introduced marine pests and native species of conservation concern. **Feral or In Peril** is based on the principle that it is better, and more cost effective, to prevent damage than to repair it. It has been successful in reporting the first introduced marine pest found on Kangaroo Island, and sightings data is passed on to relevant scientists and government agencies to help them make informed management decisions.

Through these activities the program is developing a state-wide early warning network capable of detecting introduced species before they establish, and keeping an eye on the spread of marine pests already established. The native species of conservation concern are all species about which very little is known and scientists would like more information. Sightings data being encouraged includes information about habitat, precise location, size, number, and, if relevant, male/female. All sightings can be reported online through the website: <http://www.reefwatch.asn.au/fpreport>.

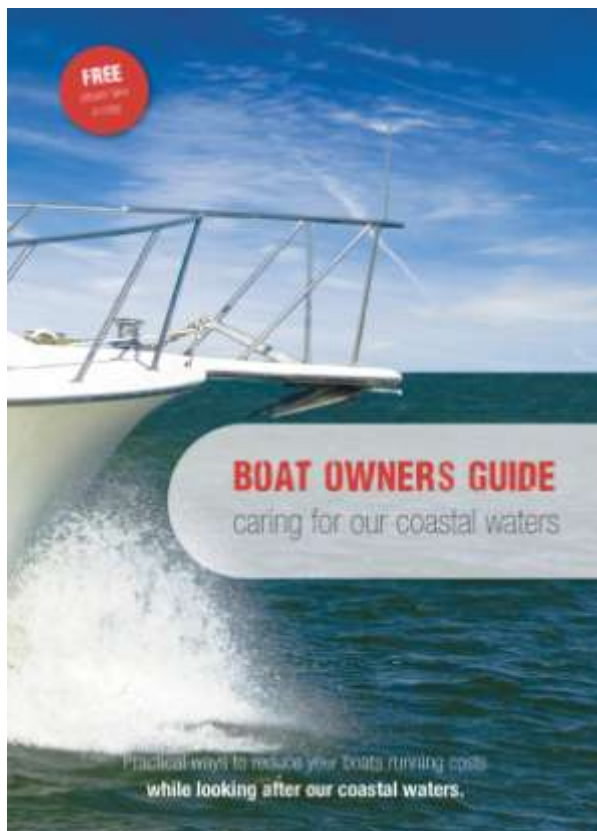
The **Feral or In Peril** program has recently published a new 16-page booklet: “Boat Owners Guide to Caring for our Coastal Waters”. The booklet details practical ways to reduce your boat’s running costs while looking after our

coastal waters. The guide is an extension the of long running program, providing more information around marine pest and threatened marine species awareness, especially with regard to boat maintenance and the identification and reporting of marine pests.

Marine pests are great hitch hikers and readily attach themselves to hulls, internal seawater systems, damp spaces or to boating gear such as anchors, ropes and buckets. Recreational boats are known vectors of marine pest transportations and with more than 1 million recreational vessels in Australia, there is increased potential for pests to be inadvertently spread as boats move from one place to another.

Reef Watch Project Officers are available to provide a short presentation about the **Feral or In Peril** Program and the new Boat Owners Guide to any interested groups. More information, copies of the booklet and bookings for talks can be made by contacting Carl Charter: feralperil@conservationsa.org.au; (08) 8223 5155

Current partners in this program include Biosecurity SA, the Adelaide and Mount Lofty Ranges NRM, Kangaroo Island NRM Board, Department for Environment and Natural Resources, Boating Industry Association SA and the Australian Government Caring for Our Country program.



Tennyson Dunes Coast Care Group

The Tennyson Dunes reserve is located 12 km northwest of the Adelaide CBD off Military Road, Tennyson. The reserve occupies 11 hectares and has a sea frontage of 900 metres and is the only complete dune system of its kind left in the Metropolitan area.

There are 52 native plant species, 16 of which are rated significant conservation status. Significant numbers of fauna such as painted dragons, marbled geckos, bearded dragon lizards, blue tongue lizards kestrels, singing honeyeaters and others live there.

Many pressures are on this wonderful reserve, such as feral weeds, garden escapes, foxes, rabbits and people. The Tennyson Dunes Group was formed 15 years ago to help combat these threats through weed control, threatened species recovery and community education.

Each year the Group runs an open day with guided walks to assist people to gain an in-depth appreciation of dune ecology and the importance of conserving these areas.

The Group also has a bigger plan to develop the existing car park into an educational Gateway with an interpretive centre for the public. There has already been a plant identification trail established with brochures to help self-guide people around as well as signage.

New members are always welcome. Please contact the Natural Resource Officer at the City of Charles Sturt on 8408 1111 if you would like more information.

Contributed by Val Wales