Coastal plains: land use and the environment

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Five years ago, this Journal of Agriculture reported on ways to overcome severe algal pollution of the Peel-Harvey estuarine system, 70 km south of Perth.

Clearing, drainage and agricultural use of the catchment had increased the amount of phosphorus reaching the estuaries and caused prolific growths or 'blooms' of algae. As well some of the algal types had previously not been prevalent in estuary waters, indicating that the estuarine environment was severely disturbed.

Weed (algal) growth was affecting the recreational and fishery values of the estuary. The decomposition of dead weed polluted the air and, at times, produced noxious gases that could constitute a health hazard.

Weed harvesting and removal, recognized at that time as treating the symptoms and not the causes, was damaging shorelines and costing about $250,000 per year.

In May 1988, Stage 2 of the Peel-Harvey Inlet Environmental Review and Management Plan (ERMP) was released and opened to public comment. This and other reports, plus proceedings from several conferences, have provided guidelines and objectives for improved land use and environmental management of Western Australia's coastal plains.

Several articles in this issue of the Journal of Agriculture discuss improved agricultural practices on the Swan Coastal Plain in particular, although the principles will apply to similar eutrophication of the Albany harbours, Wilson Inlet and the Vasse-Wonnerup Estuary. They also emphasize the fine balance between man's demand for potable water and land for rural, industrial and urban use.

Vegetables and fruit account for about 75 per cent of the total land and water used by horticulture.
Why are coastal plains vulnerable?

The coastal plain regions of the south-west of Western Australia, such as the Swan Coastal Plain or the Albany Coastal Plain, are relatively narrow strips of land lying between the sea and the uplifted, inland plateau. These strips of land are sedimentary basins unlike the inland areas which are based mainly on granite rocks.

Coastal plain areas are flat with predominantly sandy soils and have been intensively cleared and drained for agriculture. For example, about 80 per cent of the coastal catchment of the Peel-Harvey estuary has been cleared, and there is an intensive network of man-made drains to control flooding of agricultural land and to protect roads and townships. Eighty-five to 90 per cent of the soils are classed as sandy. Sands have a poor ability to bind and retain nutrients and other contaminants applied to the soil.

Almost all the rivers on the Swan Coastal Plain drain into the estuaries and wetlands (see map). Water running off the land to drains or percolating downwards, readily carries contaminants with it to estuaries, wetlands or groundwater. Over-pumping of the groundwater can result in a lowering of the watertable and lead to a loss of wetlands, or saltwater intrusion into aquifers.

In addition, up to 15 per cent of the soils on the Swan Coastal Plain have become saline as a result of clearing of land.

The coastal plains, climate, port facilities and recreational amenities make them ideal for urban, industrial and agricultural development. The pressures from population growth lead to conflicts about land-use, and the risks of environmental damage from inappropriate land-use are high.

The Swan Coastal Plain between Gingin and Bunbury is a typical example, supporting and providing the infrastructure for more than 80 per cent of the State's population.

Soils and groundwater

Sandy soils combined with high rainfall allow excellent recharge to groundwater, and our coastal plains are highly suitable groundwater storages. They contain all the major underground water resources in the South-West. The most accessible and therefore cheapest of the underground water supplies to exploit are found in shallow, unconfined (superficial) aquifers within the upper layers of the deep sandy coastal plain soils.

The State's demand for flowers and ornamentals is expected to reach $54 million by 1996, more than double the 1986 value.

The extent of the Swan Coastal Plain. Almost all the major rivers drain into inlets and estuaries.
All the reports mentioned below have a common thread running through them - the present and potential environmental threat from inappropriate land-use practices on our coastal plains, and the threat to the range of future alternative uses of this land and water resource.

The major reports total some 1300 pages. They are:

• The Swan Coastal Plain in Crisis - agriculture and the environment. A conference conducted by the Western Australian Branch of the Australian Institute of Agricultural Science in November 1987.

• Swan Coastal Plain Groundwater Management - a conference conducted by the Western Australian Water Resource Council in October 1988.

• The Urban Water Balance Study (Perth Metropolitan Region), published by the Water Authority of Western Australia in May 1987.

• Gnangara Mound Groundwater Resources Environmental Review and Management Programme (ERMP), published in November 1986.

• Peel Harvey Inlet Stage 2 ERMP, published in May 1988.

This water is exploited heavily for horticultural use, home gardens, public (domestic) water supplies and for irrigating parks and gardens. It is also the water that supplies lakes and other wetlands. In many areas use of this superficial aquifer is already at its safe limit. The aquifer is recharged or replenished directly from rainfall on the soil surface above it.

Replenishment is rapid through the porous sands which have little ability to retain or filter out contaminants. The type and intensity of land-use above the groundwater resource can lower its quality. Groundwater polluted with nutrients, for example, can then possibly seep into wetlands or drains leading to wetlands or estuaries, thus extending the pollution.

Problems from inappropriate land-use can arise from:

• Urban development, which is beginning to encroach on groundwater areas required for public domestic supplies south and north of Perth, can contaminate groundwater with nutrients (nitrate and phosphate) from septic tanks and fertilization of lawns and gardens. Run-off from urban drainage systems exports similar levels of phosphorus that come from agricultural land.

• Industrial sources of contaminants from accidental spillages being washed off paved surfaces during clean-up operations or by rainfall run-off. Contamination can also arise from illegal disposal methods or faulty storage procedures.

• Intensive agricultural land-uses such as horticulture, piggeries and sheep holding yards result in high application of nutrients to the soil which can leach into groundwater or surface drains if not properly controlled.
The Peel Inlet and Harvey Estuary ERMP - Stage 2

In May 1988 after more than ten year’s study, the Peel Inlet and Harvey Estuary Stage 2 ERMP was released for public comment. In it, the earlier studies were collated and summarized and a management strategy proposed.

The proponents for this ERMP were the Department of Agriculture and the Department of Marine and Harbours. The main proposals were:

• The construction of the 1.6 km Dawesville Cut to increase flushing of the estuarine system as soon as practicable.

• Continued harvesting of the weed.

• A series of catchment management measures:
  
  o the preparation and implementation of a catchment management plan that matches land-use with the capability of that land to sustain that use without excessive loss of phosphorus.

  o control of existing and future point sources of nutrients such as market gardens and intensive animal industries.

  o a moratorium on further drainage and clearing until suitable policies and guidelines for future land clearing and drainage are developed.

  o conversion of up to 55,000 ha of land to forestry where it is an economical alternative to agriculture.

  o continuation of the present fertilizer management strategy to encourage efficient use of fertilizers and the development and use of special fertilizers such as slow-release types and spreadable forms of sulphur fertilizer.

The aim of these catchment management measures is to reduce the amount of phosphorus reaching the Peel-Harvey Inlet from 140 tonnes per year to about 85 tonnes per year, while allowing for seasonal variations in rainfall and run-off. The success of the catchment management will then be gauged by the trends in the levels of phosphorus reaching the Inlet. These levels will be monitored by the Waterways Commission who are managers of the Inlet waters.

In January 1989, the Minister for Environment agreed to the ERMP management proposals subject to certain conditions (the so-called Ministerial conditions). Under the Environmental Protection Act (1986), the Department of Agriculture is responsible for carrying out the catchment management proposals and the Department of Marine and Harbours for the Dawesville Channel. The Waterways Commission will monitor water quality and supervise weed-harvesting.

Agriculture and the environment

As a large land-user agriculture is clearly under the spotlight with regard to environmental problems of the coastal plains. Agriculture has been a major contributor to our past economic growth, but the challenge is now to seek improved methods that avoid or correct the environmental problems arising from past practices.

The scientific work on the Peel-Harvey estuarine system identified and studied problems common to coastal plains environments throughout the State’s South-West. Similarly the management proposals in the Peel-Harvey Stage 2 ERMP and the Gnangara Mound Groundwater Resources ERMP are relevant for the protection and co-existence of recreational, ecological and groundwater resources of coastal plain environments. For the Swan Coastal Plain however, pressure from population growth makes the problems more complex and immediate.

Horticultural irrigation practices will have to change to safeguard the coastal plains environment.

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