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Wetland Rehabilitation and Sustainable Land Practices: An Harmonious Coexistence

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[Submitted Paper]

Newcastle, New South Wales, on Australia's east coast has been recognised in the past as one of Australia's major industrial centres. Pollution and environmental degradation were associated with the region's industrial heritage. Dredging and land reclamation in the Hunter estuary began as early as 1859, initiating the industrialisation of Newcastle. In 1951 the Public Works Department of New South Wales commenced a 20-year dredging and land reclamation project that joined more than nine islands in the estuary, with a resultant loss of an estimated one thousand hectares of fisheries and other wildlife habitat.

In 1996, on the eve of the City's Bi-Centenary, the Kooragang Wetland Rehabilitation Project is restoring more than thirteen hundred hectares of degraded fisheries and other wildlife habitat in three locations within the estuary. The concept of a City Farm, as an integral component of the wetland project, was first proposed in 1992 to acknowledge the history of agriculture in the estuary.

The potential of the Kooragang City Farm

In the "Kooragang Wetland Rehabilitation Project – Strategic Landscape Plan"¹, the concept for a City Farm included suggestions as to the various agricultural pursuits.

"The establishment of a City Farm could provide educational and demonstrative displays of different types of progressive agriculture and agricultural techniques including aquaculture, permaculture, orchard, windbreaks, animal husbandry, land management, recycling of wastes, reversing land degradation, alternative energy, and attractions for the public and school experimental plots. Components of the City Farm should be self-sustaining systems that have no negative effect on the surrounding natural areas."

¹ *Kooragang Wetland Rehabilitation Project – Strategic Landscape Plan* (Land Systems EBC 1994)

It may well be that the success or failure the Kooragang City Farm lies in the project's ability to meet the last sentence from that quotation. Agriculture for 200 years in Australia may be said to have failed dramatically in this regard. Kooragang City Farm will strive to set bench marks in appropriate land use in our fragile natural landscape.

However, as with many sites, Kooragang is not without its challenging existing conditions, which will require creative and innovative responses in order to realise the farm's potential. Kooragang City Farm enjoys: a temperate climate; modest rainfall (1000 mm/annum); a reputation as one of New South Wales' windiest locations; potential acid sulphate soils; a high saline water table; scant remnant indigenous vegetation complimented by an impressive selection of exotic weeds; a location within an aluminium smelter's buffer zone; and a one in one hundred year flood level in excess of two metres above natural ground.

Despite these challenges Kooragang City Farm has a number of priorities which will be achievable within five years:

- The entire west and south boundaries will be protected by wind breaks.
- Internal wild life corridors will be created along existing seasonal water ways.
- Grazing of existing pastures will be conducted using time managed grazing practices, which will assist with natural weed control and organic pasture improvements.
- Woodlots will be planted for a variety of yields, which will also act as wildlife corridors, wind breaks and shelter belts during growth.
- A multi-functional farm house, administration office and education centre will be built.
- Permaculture designed vegetable, fruit and herb gardens will be created around the farm house, leading to more extensive orchards of fruits and nuts, including indigenous foods.
- Trial gardens of water plants and demonstration aquaculture sites will be created.

The historic, existing and proposed agricultural land use

The Worimi and Awabakal Aboriginal tribes frequented the islands of the Hunter estuary, living on fish, shellfish, water birds, kangaroo and the many plant foods that were to be found in abundance. It appears that both tribes regarded the islands of the estuary as common ground, using the river as the dividing line between tribal lands.

From 1797, commencing with Lt John Shortland, the European occupation of the region began. Within two years both coal and timber were being removed from the lower Hunter, for export overseas. By the early 1800s most of the cedar had been removed from the estuary.

Farmers soon followed the retreat of the timber getters, with a major land grant of 2560 acres given to Alexander Walker Scott in 1829. All of the current City Farm, and most of Ash Island, were under Scott's ownership. Date palms planted by Scott still remain, as do the remarkable drawings of the flora and fauna of the island, prepared by his two daughters, Harriet and Helena. The detailed pictorial record of the islands' botany provides the foundation for much of the rehabilitation project's revegetation work.

From the mid 1800s to the early 1900s much of the fruit, vegetables and farm animal produce for Newcastle came from the island of the estuary. Cereals and grains combined with dairying and continued up to the major regional flood of 1955. The New South Wales government then resumed all the freehold land and rezoned the islands for industrial use. From that time, to the current day, the major land use on Ash Island has been low grade grazing of beef cattle on short – term grazing licences.

Recognising the rich agricultural heritage of the island, and the need to demonstrate a method of agriculture that would not conflict with the objectives of the wetland rehabilitation project, the concept of a City Farm was developed.

Over the next five years Kooragang City Farm will develop demonstration sites that will have a far reaching appeal to educational and agricultural interest groups of the region and beyond.

The farm will be developed utilising organic principles that will not impinge upon the operation of the adjacent nature reserve and wetland project.

Integration of the farm within the wetland rehabilitation project

From early 1994, the focus of the City Farm project has been to adopt permaculture principles to design an integrated farm plan that would enable the creation of a land system trialing and demonstrating agricultural techniques that will preserve the integrity of wetland ecosystem while encouraging alternative and sustainable agricultural production.

To this end Kooragang City Farm will implement the following strategies, as part of a whole farm planning approach to the development of the land, which will facilitate the integration of the farm into the surrounding ecosystem:

- Areas of seasonal freshwater swales will be fenced in wide corridors and supplemented with appropriate natural vegetation to assist in the creation of a network of wildlife corridors. These corridors will link vegetation communities external to the farm.
- The northern boundary consists of mangrove and salt marsh communities along the bank of the north arm of the Hunter River. This area will also be fenced and a band of ground covers and sedge like grasses planted to facilitate the reduction of nutrient and sediment runoff from the farm land.
- Where required all wind breaks will be constructed with sufficient width and diversity of indigenous plant species that they will also function as wildlife corridors.

- Past land practices included uncontrolled grazing of cattle into salt marsh, water course and mangrove areas, a practice which will not be allowed to continue on City Farm.
- Aquaculture demonstration sites will be established focusing on the production of fingerling and nursery stock of species indigenous to the estuary for release back into the estuary.
- Artificial wetlands will be created to enhance habitat options for various native species.
- Secluded areas will be developed as sanctuaries providing habitat and roosting sites for birds.
- Remnant pockets of dry littoral rainforest will be protected and bush regeneration strategies implemented to enhance their expansion.

One can summarise the over riding objective of the above strategies as simple as endeavouring “to work with, rather than against nature”.

The importance of the project as an educational resource

An education program is under development to provide opportunities for students to experience and investigate estuarine ecosystems and sustainable land use, and encourage their appreciation of the dynamics of these systems.

The City Farm and adjacent wetlands appeal to primary and secondary school students studying science, geography, biology, agriculture and horticulture. TAFE and University groups are utilising the project for research and project work in fields such as biology, geography, environmental science, surveying, land care, bush regeneration and civil, electrical and mechanical engineering.

As the City Farm facilities become available, courses in land care, bush regeneration, organic farming and, of course, permaculture will be conducted on site in the field classroom and demonstration plots.

Numerous labour market programs for education and vocational training have utilised the project for their field experience.

The farm house will be an important educational feature providing a working model for sustainable housing, employing solar and wind power generation, solar design, grey water reuse systems and composting toilets. The University of Newcastle is involved in the design, construction and long term monitoring of the farm house as a field research station in alternative technologies.

Project research and its relationship with ecosystem management

The focus of the research is to provide direction to the adaptive management program, determining particularly how to plan and implement habitat rehabilitation that increases the use by birds, fish and other aquatic fauna. In addition it will

provide base line data for vegetation management of the wind break/wild life corridors, pastures, orchards and woodlots once trials of organic, bio-dynamic and permaculture practices are commenced.

The research program is directed by scientists from The University of Newcastle, University of New South Wales, NSW National Parks and Wildlife Service and NSW Fisheries.

Research projects currently or recently undertaken on the Kooragang project:

- Measurement of tidal inundation.
- Pre-emptive competition of salt marsh with pastures.
- A study on benthic invertebrates.
- Mangrove trees and river bank restoration.
- Vegetation monitoring by aerial photogrammetric imaging.
- Vegetation monitoring by replicate quadrat analysis.
- Water quality.
- Ground water.
- Hydrology.
- Productivity of vegetation communities using infrared gas analysis.
- Mosquito productivity and habitat.
- Review of wetlands in Australia.
- A survey of the value of wetlands.
- Fish and decapod crustacean monitoring by sampling species distribution and quantity.
- Hydrologic modelling of ground water interactions.
- Acid sulphate soil mapping.
- Water bird and migratory shore bird monitoring.
- Impact of cattle grazing on mangrove and saltmarsh ecosystems.

Kooragang City Farm will directly or indirectly benefit from most of the above studies, giving the proposed alternative agricultural practices the luxury of detailed scientific research with a wealth of base line data supported by on-going independent research and monitoring. It is for this reason that Kooragang City Farm may find itself placed on the world stage for 'sustainable agricultural land use in harmonious coexistence with ecosystem management' in the next century.

Kooragang Wetland Rehabilitation Project was winner of the 1995 River Care 2000 Gold Award for Community Projects and Newcastle City Council's 1995 Environmental Achievement Award for Community Partnerships. Kooragang City Farm is proudly sponsored by the National Landcare Program of Australia. City Farm projects have existed for more than a decade in Australia. Diversity in the format of city farms, and their role in the community, is as varied as the cities in which they are found.