Assessing Historical Change in Coastal Environments

Port Curtis, Fitzroy River Estuary and Moreton Bay Regions

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**Report to the
CRC for Coastal Zone Estuary and Waterway Management**

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COVER PAGE FIGURE: One of the challenges inherent in historical assessments of landscape change involves linking remote sensing technologies from different eras. Past and recent state-of-the-art spatial images are represented by the Queensland portion of the first map of Australia by Matthew Flinders (1803) overlaying a modern Landsat TM image (2000). Design: Diana Kleine and Norm Duke, Marine Botany Group.

A Report to the Coastal CRC and its Stakeholders

This report contains the findings of the historical assessments of the Port Curtis, Fitzroy River estuary and Moreton Bay regions. The information and findings were gathered over the duration of a three year program with the Historical Coastlines Project of the Coastal CRC.

The work presented applies particularly to the HC2 task and includes one aspect of the HC4 task, namely the assessment of field information on wetland vegetation structure and species composition. The Methods and Strategy used have been developed further in this assessment to identify and define the ecological indicators being used and developed in this and associated projects. The findings in this report represent the final stage of an iterative process designed to combine expert evaluation and stakeholder feedback within the Coastal CRC.

Executive Summary

During the past two centuries, human development has increased dramatically, resulting in massive alterations to coastal features to accommodate ever-growing demands of industry, trade and population. Notable significant losses have been observed for tidal wetland habitat in coastal areas. Accurate quantification and interpretation of these long-term changes are essential to provide comprehensive resource information that will enable more effective management of coastal habitats threatened by human and natural influences. The aims of the current report were to document and assess historical change of coastal features and vegetation (e.g. mangroves) in Moreton Bay, South-East Queensland, particularly over the last 50 years, and to relate these changes to human or natural drivers. This was achieved through time comparisons of digitised aerial photograph images spanning 50 years for both the region (broad-scale) and detailed case studies (localised fine-scale). The detailed case studies comprised a site under direct human influence (The Greater Brisbane River region: Luggage Point, Bulwer Island), and a site primarily under natural control, distal to direct human influence (Cobby Cobby Island in Southern Moreton Bay). Vegetation maps of the regional and case study sites were produced depicting current and historical mangrove and saltmarsh/ saltpan distribution. Port Curtis, Fitzroy and Moreton Bay represent areas of industrial, rural and urban development, respectively.

In Port Curtis, there was a regional loss of mangrove (1470 ha or 38%) and saltmarsh (1340 ha or 34.8%) between 1941 and 1999. In the human-affected case study (Calliope River and Auckland Inlet), a 339 ha (30%) loss of mangrove area and a 2 ha (0.4%) loss of saltmarsh was found over the same 58-year period. The substantial loss of mangrove was largely attributed to reclamation activities. In the naturally-affected case study (Endfield Creek, southern Curtis Island), small losses of mangrove (5 ha or 3.5%) and saltmarsh (4 ha or 12.5%) were measured between 1959 and 1999.

In the Fitzroy River, there was a gain of 300 ha (9.1%) of mangrove and loss of 1150 ha (40.9%) of saltmarsh between 1941 and 1999 for the human-affected case study (Fitzroy River Estuary), also representative of the regional view. Notably, there was a 40 ha (14.3 %) gain of mangroves in the newly-formed islands in the river mouth, and a 210 ha (11.2 %) gain of mangroves in the broad river mouth region. These gains were largely attributed to depositional gains, possibly due to changes in sediment loads and river hydrology. In the naturally-affected

case study (Balaclava Island), losses of mangrove (4 ha or 4.8%) and gains of saltmarsh (7 ha or 3.3%) were detected from 1956 to 1999. As zonal shifts were observed, these changes appear to have been related to climate change.

In Moreton Bay, there was a regional net loss of both mangrove (313 ha) and saltmarsh/ saltpan (3041 ha), during the period 1974-1997, comprising a total loss of approximately 3353 hectares of tidal wetland (19.5 %). Between 1946 and 2002, in the Greater Brisbane River subregion alone, there was a significant loss of tidal wetland, totalling 1513 hectares (46 % decline), comprised of 543 hectares of mangrove and 973 hectares of saltmarsh/ saltpan communities. This subregion has been a major focus of disturbance to wetlands in the region, with major losses resulting directly from human driven change. For instance, a large proportion of this disturbance (850 ha) was due to the development and expansion of the Brisbane Airport around 1980. However, industry and port development in this region have also contributed significantly. Similar trends of wetland change within the Luggage Point and Bulwer Island case studies were observed, where 273 hectares (54 %) and 136 hectares (61 %) of tidal wetland area were lost (respectively) principally due to human development (reclamation). The Cobby Cobby Island case study revealed significant historical shifts in vegetation. These may be indicative two relatively natural processes: (a) local sea level rise, with zonal shift as encroachment of wetland areas into terrestrial habitat with corresponding loss at the seaward edge, and (b) climate change, with mangroves being replaced by saltmarsh/ saltpan. However, it is not yet clear whether the effects observed on Cobby Cobby Island are localised or characteristic of the wider region and acting on a global scale.

One of the chief objectives of this study has been to detect and quantify both natural and human-driven change in coastal ecosystems. Clearly, by providing such information and revealing the relative effects of particular drivers, such as reclamation and climate and sea level change, in the past, the study will aid future decision-making and management of all coastal areas. Knowing the causes of change will allow environmental managers and developers to predict the likely consequences of their actions, and place them in a position where they might mitigate, accommodate, or plan around change. It is proposed with this study, also, to tease apart natural trends from human drivers of change, so there might be better-informed application of effective longer-term planning and management.

A major outcome of the project has been the development of a practical classification system for assessment of change in tidal wetlands in 12 main types. For each type of change, ground

and remote sensing indicator tools, based on major diagnostic features were used to identify the most likely driving factors, where this was not otherwise known and documented. Dichotomous keys provide further useful tools for making decisions about identifying change in tidal wetlands, based on both ground observations and for use in remote sensing interpretations. These classification and indicator systems will have broad use as effective management tools in the assessment, evaluation and monitoring of coastal and estuarine habitat. Such information is essential for the practical application of adaptive management strategies to protect and preserve the quality and beauty of our coastal environments.

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