

2. Project Overview

The current report aims to document and assess historical change of coastal features and vegetation (e.g. mangroves) in the Port Curtis, Fitzroy River and Moreton Bay regions in Queensland. Port Curtis and Fitzroy River represent areas of industrial and rural development, respectively, whilst the Moreton Bay region represents a region of rapid urbanisation and industrialisation, with a busy international port in the city of Brisbane. The study focuses on the changes during the last century in particular, and attempts to relate these to human activities, land use, physical factors (e.g. climate) and population data. Ultimately, the study will provide comprehensive and accurate resource information that will enable more effective management of coastal habitats threatened by human and natural influences.

Within the study, both regional assessments of Port Curtis, Fitzroy River and Moreton Bay and detailed case studies of change in specific locations within each region were performed. The regional assessment included timelines depicting human activities, and broad analyses of coastal environmental change using sources such as old charts and historical photographs. The detailed case studies employed aerial photography to investigate fine-scale change in wetland vegetation over the last 50 years, comparing sites under direct human influence with those under primarily natural control, away from human development (islands). In the Port Curtis region, Calliope and Auckland Creeks in Gladstone (human influence) and Endfield Creek on Curtis Island (natural influence) were examined while, in the Fitzroy region, the Fitzroy River (human influence) and Balaclava Island (natural influence) were used. In the Moreton Bay region, the Brisbane River and Cobby Cobby Island case studies were used to depict human and natural drivers of change, respectively.

2.1 Overview of Methodology

2.1.1 Regional Assessment

The regional assessments encompass the greater Port Curtis, Fitzroy River and Moreton Bay regions, including their major water courses, embayments, wetlands and catchment areas. The assessments include two major components: the construction of historical timelines, and broad analyses of change in coastline and coastal vegetation.

Historical timelines – The historical timelines document human activities and developments that have affected the coastline and wetlands over the last 150 years, as well as including major natural events, such as floods. Headings include: general events, navigation/ construction/ dredging, land tenure and land use, reclamation/ restoration and political/ legislative/ administrative factors. The information has been compiled from diverse sources, such as books, historical accounts, articles and anecdotal information. The timelines will contribute to the interpretation of coastal change, by outlining anthropogenic factors (and natural catastrophes) driving this change.

Broad analyses of change in coastline and coastal features – This involves collection of historical photographs, old charts and maps, and broad vegetation change analysis using digitised imagery. Historical photographs, capturing snapshots of coastline at earlier points in time, are compared with modern-day equivalents, photographed at the same location to give a visual representation of change. Old charts and maps reveal coastal features and appearance of the region prior to and at time points during anthropogenic modification. Digitised imagery and vegetation maps or data are used to make broad-scale comparisons of historical change in wetland area (e.g. mangroves). Modern-day calculations of area are derived from digitised Landsat TM images (for example, from the Department of Primary Industries in Queensland). Historical calculations of area are available for the Port Curtis region, based on a study by Arnold (1995).

2.1.2 Detailed Assessments – Case Studies

2.1.2.1 River Case Studies – Area of Human Influence

The river case studies focus on a dominant river estuary of the region, subjected to different aspects of human development and influence. The rivers chosen for each region were:

- **Port Curtis:** Calliope River and Auckland Inlet – with industrial influences
- **Fitzroy:** Fitzroy River – with rural influences
- **Moreton Bay:** Brisbane River – with capitol city influences

These rivers were chosen as they were the major river systems in the three focus regions, for the Historical Coastlines report. Each region has been notably and characteristically influenced by human population increases and port development over the last 150 years. It is these differences which make the comparison of these three regions so useful and informative,

assessing historical change, and in developing tools for the interpretation of change, and the drivers of change, in tidal wetland habitat.

Aerial photography, obtained from various sources. United Photo and Graphic Services and the Department of Natural Resources and Mines, was used to calculate the change in area of major intertidal vegetation types (mangrove, saltpan) along the Calliope and Auckland estuaries and Fitzroy River between 1941 and 1999, and along the Brisbane River between 1946 and 2002. This was achieved by scanning and creating a mosaic out of individual photographs, georeferencing the mosaic using Landsat TM satellite imagery and digitising the mosaic using ArcView to create area polygons. These were compared between years to calculate overall change.

Field verification was conducted at all three locations to affirm vegetation classifications, to ground truth mapped outlines and to aid in georeferencing by obtaining accurate GPS coordinates on distinguishable points (e.g. isolated trees).

2.1.2.2 Island Case Studies- Area of Natural Influence

The 'island' case studies focus on island sites, away from direct human contact, in order to investigate natural change driven by local and global influences, such as sea level rise and climate change. Islands are ideal for this type of study, as directional bias of prevailing climatic and hydrological conditions are minimised. The 'island' (away from human influence) sites chosen to assess local climatic effects in each region were:

- **Port Curtis:** Endfield Creek on southern Curtis Island
- **Fitzroy:** Balaclava Island, east of Port Alma
- **Moreton Bay:** Cobby Cobby Island in southern Moreton Bay.

Change in area of intertidal vegetation, between 1940s and 1999, was calculated, using the methodology described in the previous section. In the island case studies, however, spatial and compositional analyses were performed on a much finer scale and in greater detail, differentiating between communities/ species within a vegetation type (e.g. mangroves). This approach allowed sensitive detection of change in wetland composition, change in relative dominance and area of zones (e.g. *Rhizophora* zone) within a forest and shifts in ecotones over time.

Again, field verification was conducted at the three locations. In addition, transects were performed measuring relative elevation at major ecotones within the intertidal wetland in order to establish whether a correlation exists between these parameters within a given region.

2.2 Outline of Report

This report presents findings for the three study regions, Port Curtis, Fitzroy River estuary, and Moreton Bay. For each area, there are regional assessments and detailed case studies (river and island) included. The regional assessments outline the general background of the area (location, land use, climate), its history (historical photographs and charts, timelines) and broad changes in regional coastal vegetation. The river (anthropogenic influence) and island (natural influence) case studies describe the study sites and methodologies in detail, and present and discuss the results of the vegetation change analyses. Broad implications of the findings, applications for environmental managers, as well as a synthesis and review of future mitigation actions are presented.

2.3 Publications in Preparation

The following publications arising from this project are currently in preparation:-

- **Changing tidal wetlands.** A popular book showing change over the last 150 years in 3 coastal regions of eastern Australia.
- **Interpreting Change in Tidal Wetlands.** Scientific book of methods and case studies describing tools to assess and interpret change in tidal wetlands along the eastern Australian coastline.
- **Using tidal wetlands to monitor climate change.** An article describing the Wetlands Cover Index (WCI) based initially on spatial data across northern Australia to being a predictor of change as ecotone shifts correlated with changing rainfall patterns over time.
- **Severe damage to tidal wetlands following a hail storm in southern Moreton Bay.** A description of the extensive hail storm damage which occurred in the region in 1997.
- **Indicators of local sea level rise in tidal wetlands in southern Moreton Bay.** A description of zonal shift where tidal wetlands migrate as sea level changes.
- **Climate change affecting mangroves of Luggage Point and Boondall wetlands Brisbane.** Case studies of climate affects on mangrove and salt marsh habitat cover.
- **Methods for mapping fine scale change in tidal wetland vegetation.** Descriptions.
- **Environmental history of Bulwer Island in the Brisbane River.** A BP initiative.