CHAPTER 7

CONCLUSION

The present study, an integrated attempt using multi-temporal satellite data and GIS technique to understand the inherent characteristics of wetland features, their spectral reflectance pattern under different condition using image processing techniques, temporal GIS spatial analysis and their relationship with flora and fauna using field investigation in the selected study sites have brought out the following salient conclusions.

Remote sensing satellite data with its synoptic view has provided significant information on the wetland features of the study areas – Pulicat and Kalveli ecosystem. The image analysis of satellite data using image processing techniques has helped to understand the inherent characteristics of wetland features.

The spectral analysis of profiling wetland features around Pulicat lagoon showed that tidal flats support many algae species such as Enteromorpha, Bryopsis and Ulva, and in turn, aquatic flora and fauna. Spectral profiling has also helped to appreciate the interdependencies of wetland features such as tidal flat, marsh, and salt marsh, thus helping to understand their spatial extent as well.

Spectral signatures of individual features at pixel level showed that various types of tidal flats- subtidal, inter tidal and high tidal - could be differentiated by their DN values like 47, 104 and 208 in blue spectral region; 82, 148 and 255 in green region; and 109, 179 and 255 in red region respectively. Lagoon water at different places showed different DN values such as 128 (red), 66 (green) and 9 (red) near the mouth, 100, 66 and 12 near Pulicat and 109, 51 and 12 north of Pulicat leading to the inference of its physical, chemical and biological condition. Similarly, sea with different degree of turbidity showed different values but they all adhere to the specific spectral pattern of water showing high reflectance in blue region and low in absorptive red region.
The enhancement techniques such as edge enhancement, PCA and NDVI have helped to enhance wetland features such as turbid water, lagoon, various tidal flats, marsh and saltpans besides showing canal, roads and boundaries of various linear and curvilinear features by edge detection technique both at Pulicat and Kalveli area.

The knowledge derived from spectral analysis and enhancement techniques have helped to extract wetland features using unsupervised and supervised classification. It is observed that unsupervised classification without any prior knowledge has assisted supervised classification with its knowledge input in generating “training samples”.

The field based investigation has positively corroborated the relation between wetland features such as tidal flats, marsh, dune sand, sand bars, with plant species such as algae (Enteromorpha, Bryopsis, Ulva), wild grass, invasive plants species (Prosopis sp., Datura sp., Xanthocarpum sp., Tephrosia sp.) and Casuarina species respectively. The significant association between wetland features and flora has helped to appreciate their significance developing breeding ground for marine animals and nutrients to juveniles of fish and molluscs in the Pulicat lagoon.

A similar attempt in Yedayanthittu - Kalveli ecosystem has brought out the significance of spectra analysis in assessing the condition of various wetland features such as salt marsh, marsh, mudflat, mud with vegetation apart from saltpans both in “wet” and “dry” conditions. Three dimensional graphical representation of DN values of these features or classes permits to compare among wetland features and illustrates the spectral differences among them. The pixel based analysis of these features helps to establish the significance of such compilation in generating baseline data that could be used for continuous monitoring and assessment of such dynamic wetland features in the coastal ecosystem using temporal satellite data.

Enhancement techniques such as edge enhancement, PCA analysis, NDVI to understand soil moisture condition, and color inversion to demarcate significant wetland features apart from more significant unsupervised and supervised classification techniques have helped to understand the spatial pattern and distribution of ecological features and their control in preserving the Kalveli ecosystem. The
comparative analysis of spectral indicators and field investigation has clearly brought out the relationship between wetland features and flora and in turn their contribution in generating nutrients to other fauna ensuring a food chain within the ecosystem.

Lastly, collating the information derived from visually interpreted wetland maps of two periods of temporal satellite data through spatial GIS analysis, has brought out the spatial changes in area and pattern of ecologically sensitive features around Pulicat and Kalveli, and in turn their impact on preserving the flora and fauna. In Pulicat, the changes in area is mostly among *tidal flats* (in the range of +0.4 sq.km) that indicates the dynamic nature of lagoon ecosystem in developing *tidal flats* that is supporting the flora and fauna. Similarly, in Kalveli the temporal changes in area is mostly observed among *salt marsh* (-0.57 sq.km), *marsh vegetation* (+0.57 sq.km) and dynamically changing *mudflat* within the Kalveli lake (+8.24 sq.km), *mud vegetation* (-7.05 sq.km) and has helped to understand their relevance to the ecosystem. The increase in the spatial extent of *saltpans* (+0.60 sq.km) has indicated an increased human activity in the Kalveli area. Spatial pattern and changes in area of *tidal flats*, *salt marshes*, *mud with vegetation* and *saltpans* have allowed inference on human interaction with Pulicat and Kalveli ecosystems. Thus, studying changes in the ecological wetland features using GIS have thrown significant light on the extent of human interaction with the ecosystem.

In short, information thus extracted from the satellite data in conjunction with adequate field investigation has helped to understand the spatial pattern of ecologically significant wetland features and their relationship with flora and fauna of the ecosystem. It also proved that wetland features play a dominant role in controlling the ecosystem. GIS analysis is very useful in understanding the temporal spatial changes – both area and pattern - among wetland features. Above all, such an integrated approach in conjunction with other parameters could form an intelligent database to assess and monitor any changes in the ecosystem due to natural force or human intervention.