



Environmental Systems Modelling Platform

What is EnSym?

EnSym – Environmental Systems Modelling Platform – is a computer program designed to provide:

- simple and intuitive access to complex science that helps prioritise natural resource investment;
- an understanding of the environmental benefits delivered by actions undertaken in the landscape; and
- a framework for scientists and researchers to test and apply empirical and process-based scientific models.

EnSym provides users with an evidence-based framework to inform decision making about how and where to invest funding for maximum environmental outcomes.

EnSym employs scientific models to improve understanding about the impact that actions such as revegetation, weed control and riparian management, have on the landscape. Users can visualise, test and interpret results of changes in climate, land use and land management practices through a single interface.

Scientific models included in EnSym are peer reviewed, published and under continual refinement by researchers. Models are grouped into five toolboxes that relate to different sections of the landscape and analytical capabilities. Models utilise temporal (rainfall and temperature) and spatial (soil type, elevation, land use and groundwater) data as inputs and other data sources can be added as required.

Toolboxes in EnSym

Biophysical Tools (BioSym) Surface Dynamics	Groundwater Tools Groundwater Dynamics	Eco System Tools Spatial Context	Agent-based Tools Behavioural	User-defined Tools
PERFECT SWAT EPIC CAT1D	MODFLOW FEFLOW 2CSalt BC2C	Cluster analysis D-Flow Preferences Landscape linkages	Spatial optimisation Cellular automata Fire modelling Disease spread	Time series Histograms Import/Export Data manipulation Statistics
Outputs: Water use, biomass, recharge, carbon, plant growth and run-off	Outputs: Depth to water table, base flow to stream, groundwater inflows and outflows	Outputs: Connectivity, length, location (relative), size, flow lines	Outputs: Simulate behaviour of agents (disease, fire, people, animals and pests)	Outputs: Interrogation of spatial and temporal data

All scientific models utilised by EnSym are contained in a series of toolboxes

Who will benefit from using EnSym?

EnSym links science with natural resource management and decision-making. EnSym will be useful for:

- **Field and research staff** working with landholders to assess the impact of changes in land use and management for production and environmental purposes
- **Catchment managers or planners** wanting to understand complex interactions in the landscape and how the greatest outcomes can be generated with available funding
- **Investors and policy makers** seeking to fund new projects and evaluate impacts of land use changes and the effectiveness of policy scenarios
- **Advanced researchers** working on projects with a variety of needs, such as pre-experimental modelling and calibration, at the farm or catchment scale.

What can EnSym do for business?

Assist with natural resource management reporting

EnSym provides practitioners with an interface to access external data bases and generate site-specific management plans to guide landholders in the delivery of on-ground environmental works. EnSym links with GPS (Global Positioning System) technology to save time and reduce the costs of managing, reporting and processing data.

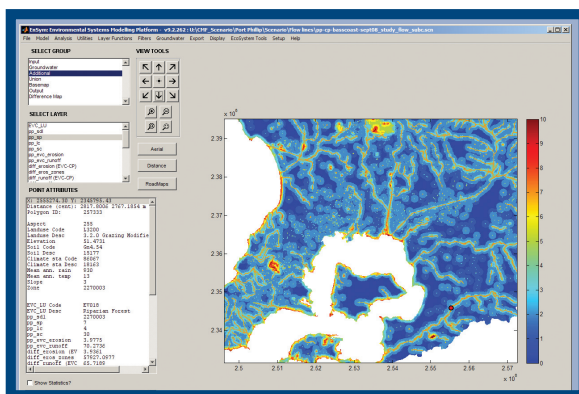
Assist in the application of market-based approaches to environmental management

Market-based approaches have proven to be successful in achieving cost-effective environmental outcomes. EnSym distils complex information and generates practical outputs to enable the broad application of these techniques. In Victoria (Australia), EnSym has been used to map management sites, process site information and field data, and estimate environmental impacts for two environmental programs:

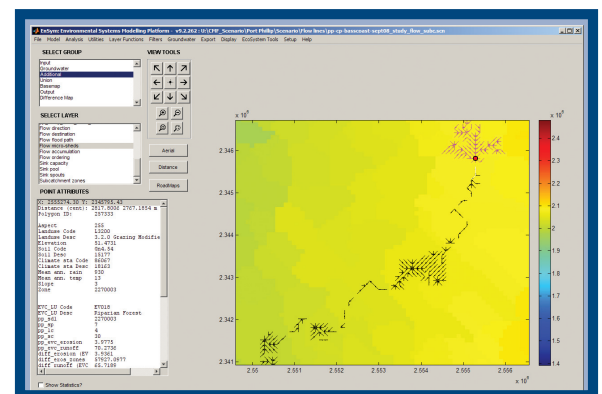
- EcoTender – an auction that competitively allocates conservation contracts to achieve multiple environmental outcomes on private land; and
- Good Neighbour Tender – a program to control environmental weeds on public and private land.

Simulate hydrological outcomes

Modifying the landscape has an impact on both the surface and groundwater systems, including the volume of water available for production and environmental purposes. EnSym can estimate how changes to land use will impact on groundwater levels and surface water – both quality (erosion and nutrient transport) and quantity (stream flow) can be estimated.



Connectivity layer



Flow lines being modelled

Improve understanding about landscape connectivity and function

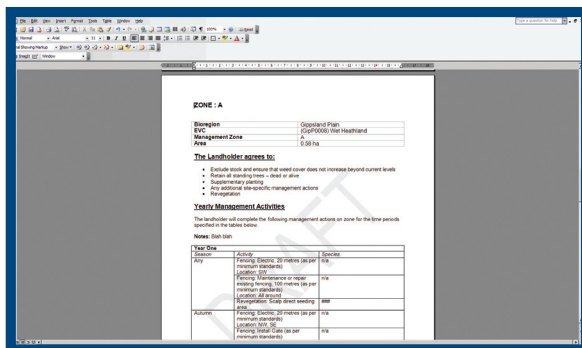
Landscape connectivity and configuration have a significant impact on landscape function, particularly the movement of many indigenous species and the location of refuge areas during climate change and drought. EnSym can estimate the benefits of actions in any given location, based on its contribution to landscape function.

Provide a research platform for scientists

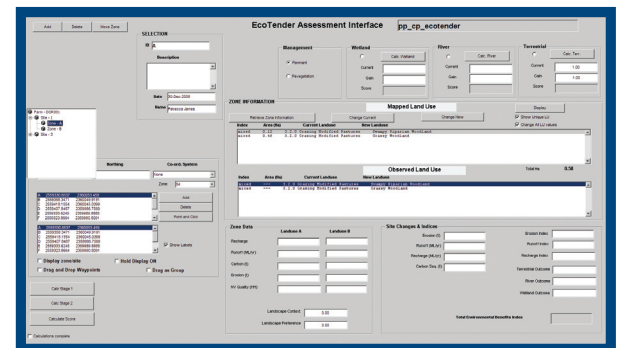
EnSym is an effective system for testing and applying new and emerging science. EnSym has simulation and statistical tools with a simple interface that enables researchers to analyse and visualise spatial and temporal modelling outputs. Multiple programming languages can be used in one platform, providing researchers with access to a wide range of scientific biophysical and empirical landscape models.

What are the main features of EnSym?

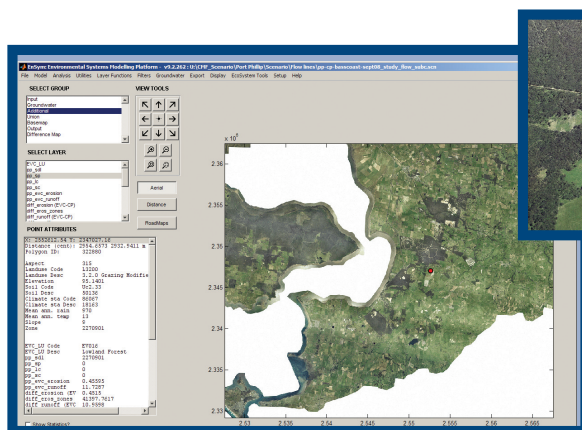
- **User friendly** and intuitive to use
- **Maps:** multiple spatial data formats can be loaded and exported for visualisation and analysis
- **Compatible with GIS:** ability to interface with GPS and other GIS units by importing and exporting files. This enables easy loading of data obtained during a site visit
- **Spatial analysis:** data can be loaded at a range of resolutions (20–500 metre grids) for scientific modelling at farm and catchment scale. A variety of data can be loaded simultaneously and statistical information generated for a specific site
- **Centralised data storage** enables access to a variety of data sources from one location while using one software system. Data layers can be easily added and removed



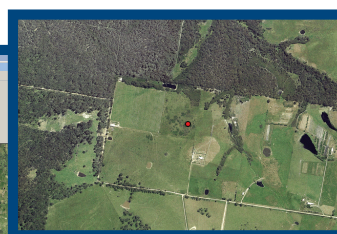
Management Plan



EcoTender Assessment Interface



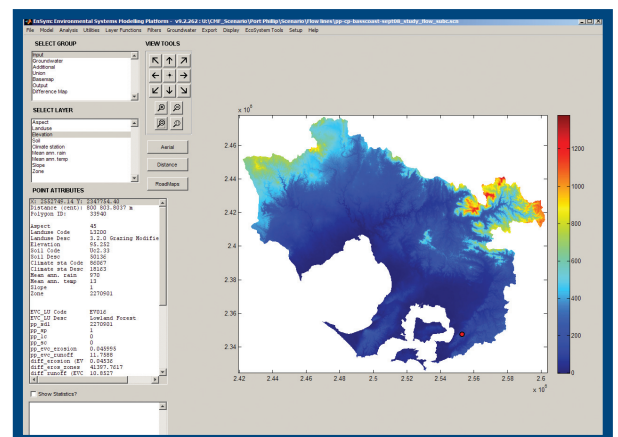
Aerial photography for all of Victoria



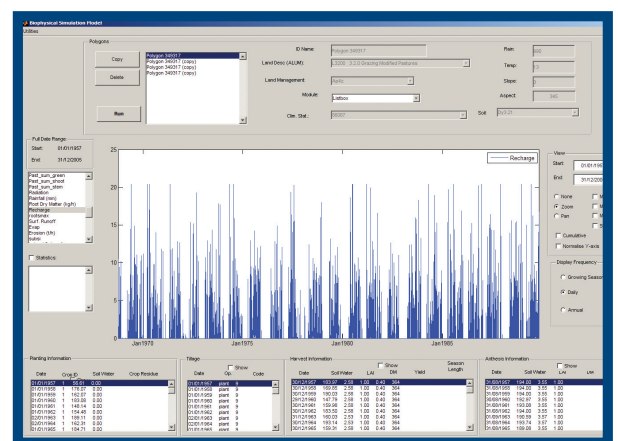
Close-up of farm indicated by red dot



- **Models:** credible scientific models cover a wide range of landscape interactions, including groundwater, surface flow, salinity, erosion, carbon, ecology, nutrients and plant growth
- **Simulations** can be run to predict a range of environmental outcomes
- **Easy integration:** new landscape models can be easily incorporated, ensuring science is up-to-date
- **Environmental benefit scores:** environmental outcomes affecting native vegetation, river, wetland and catchment health can be scored
- **Site management plans:** management plans can be automatically generated, saving time and effort. EnSym can also overlay aerial photography into management plans to help identify regions of interest
- **Web enabled:** can access web-delivered services such as remote data and mapping storage systems
- **System Requirements:** 4 GB RAM; Intel dual-core processor; 40GB of free disk space; Windows XP/2000/Vista (32-bit)



Spatial data layer – elevation for Port Philip and Westernport catchment



Surface run-off modelled for a catchment using historical data (1957 to 2007)

Further Information

For more information, please contact the DSE on **136 186** or visit www.dse.vic.gov.au/ecomarkets

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