

C-Plan demonstrations

Overview of C-Plan

C-Plan is an interactive decision support system for conservation planning. It can be used as:

- an interactive tool during negotiations over land use planning;
- a tool to aid individual planners in identifying alternative systems of reserved lands that meet their conservation requirements;
- an educational tool to demonstrate conservation planning principles to students;
- a research tool for gap analysis, conservation planning, and simulating alternative futures for an area of land under study.

C-Plan was developed by Bob Pressey and Matthew Watts of the New South Wales National Parks and Wildlife Service in Australia. It was used for extensive negotiations over land use in New South Wales, resulting in hundreds of thousands of hectares of new reserves being gazetted in the eastern part of the state. It has also been used in other land use processes in Australia and internationally, including the Cape Floristic Region of South Africa, south-west China, and the Amazon floodplain. It has been described in *Science* as the "Gold Standard" software in its field.

Key Concepts

The basic data used by C-Plan consist of:

- a set of planning units;
- biodiversity and environmental features occurring in those planning units;
- representation targets for those features (normally in hectares).

C-Plan uses these data as:

- a planning unit table derived from a planning unit shape file;
- a features table derived from feature layer(s);
- a matrix with the amount of each feature in each planning unit..

Additional data that can be taken into account include:

- vulnerability of features to threatening processes;
- vulnerability of planning units to threatening processes;
- costs of planning units expressed as forgone resources (eg. timber volume, minerals) or acquisition costs.

Outputs of C-Plan include;

- "irreplaceability" values for each planning unit;
- feature reports showing the representation level of each feature;
- alternative reservation "scenarios" generated by C-Plan processes.

The irreplaceability of a planning unit indicates its likelihood of being required to achieve conservation targets for all features. These values are recalculated dynamically as areas are added to or removed from the current proposed conservation areas. The feature report shows how many hectares, or how many occurrences, of each feature are in proposed conservation areas at any time. The conservation scenarios show alternative sets of planning units that planners can consider for conservation action. For example, you might generate 3 scenarios, scenario A, B and C, that relate to low impact on resource use (e.g. logging) (A), medium impact (B), and high impact (C). These scenarios can be used to demonstrate the differing impact on available commercial resources of different approaches to planning.

Planning Issues

C-Plan can be used to encourage discussion of planning issues by providing a transparent medium for stakeholders to view data, view alternative scenarios, and develop scenarios. This

allows stakeholders to feel a sense of "ownership" to scenarios through being involved in developing them, and it gives them an appreciation of the complexity involved in designing a set of comprehensive, adequate and representative conservation areas.

The software can be used to demonstrate problem solving by, for example, generating a set of planning units that meets conservation requirements, or partly meeting the conservation requirements with a differing impacts on resources.

Introduction to Software

C-Plan consists of a computer program comprising more than 100,000 lines of computer code. It interfaces with ESRI ArcView GIS 3.X, Marxan, and spatial configuration software to create an interactive decision support tool. Functions within C-Plan allow users to dynamically select or de-select planning units from up to 5 reserve classes, then see the results of these decisions shown in the GIS so that they can interactively build and explore scenarios.

Reports can be generated for a scenario showing:

- the irreplaceability of planning units;
- the representation level of environmental features;
- the impact of reserved planning units on resource availability.

Alternative futures can be generated according to differing conservation requirements and resource usage, aiding research into conservation planning principles.

Building C-Plan/Marxan datasets

C-Plan includes a number of advanced, integrated tools for building C-Plan datasets for different areas of land. These are automated to simplify the process of reporting on intersections of planning unit layers and environmental feature layers, then incorporating these reports into a C-Plan database.

C-Plan uses dBaseIV as its principle data format, so includes a range of sophisticated and generic functions that can be performed on dBase tables. This includes SQL queries, table imports, table joins and editing tables manually. It is a fully featured and customised database management system, principally for building C-Plan datasets, but it can also be used on other dBase tables.

Interaction with Marxan

Marxan can use C-Plan as an interface to build Marxan datasets that correspond to the current C-Plan scenario, running Marxan functions such as simulated annealing, then displaying the results in the GIS and incorporating them into additional C-Plan scenarios. For example, Marxan can be used to "fine tune" scenarios generated by C-Plan, optimising them for resource usage according to differing criteria.

More simply, C-Plan can be used as a handy way to build Marxan datasets from GIS layers, and display results from Marxan calculations in the GIS.

Selection of references that have used or discussed C-Plan

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