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A MANAGEMENT INFORMATION SYSTEM FOR THE CONTROL OF PEST ANIMALS AND PLANTS IN VICTORIA, AUSTRALIA.

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ABSTRACT: The State Department of Conservation, Forests and Lands (CFL) administers legislation relating to the management of pest animals and plants throughout Victoria. CFL conducts control work on public land and assists landholders with programs on freehold land. To provide an information base for the management of CFL's pest control programs, the Pest Management Information System (PMIS) was developed. The PMIS captures descriptions of pest infestations, details of planned and actual treatments, and evaluations of treatments. The first version of the PMIS, developed for microcomputers, was released in 1987 and underwent minor revision during 1988 in the light of field experience. During 1989 the PMIS was redeveloped using in-house computer prototyping tools on CFL's statewide computer network. It is currently being trialed in two regions prior to wider implementation. Initial results from the pilot trials indicate that the PMIS will in time become a valuable tool in the management of pest animal and plant problems in Victoria.

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INTRODUCTION

The State of Victoria occupies only 3% of the total area of Australia, yet contributes 23% of the gross value of the nation's agricultural production. Today 39% of Victoria remains public land, of which 23% is reserved under the National Parks Act.

The State Department of Conservation, Forests and Lands (CFL) is a large land management and conservation agency employing over 4,000 people at 150 offices and 300 depots and workshops. Services are delivered through 16 regions which range in size from around 2,000 to 41,000 km^2 and encompass a wide diversity of climate, vegetation, land form and land use. Head office divisions provide policy, planning, research and development, and administrative support.

European settlement has led to the extinction of 21 species of mammals and 34 taxa of vascular plants, and numerous others are now rare or threatened (Menkhorst 1987, Bennett et al. 1989, Gullan et al. in press). Conversely, many species have been introduced (Rolls 1969, Parsons 1973, Balmford 1978a,b; Brunner et al. 1980) which variously damage or threaten primary production or conservation values (Jones and Coman 1981, Nolan 1981, Triggs et al. 1984, Coman 1985, Backholer 1986, Carr 1988, Combellack 1989).

CFL carries out control programs on a range of pest animals and plants on public land. On freehold land CFL encourages work by landholder groups, provides advisory and regulatory services, and does some work on a contract basis. To provide a standardised basis for the planning, recording, and evaluation of CFL's pest control programs, the Land Protection Division developed the Pest Management Information System (PMIS). This system, first released in October 1987, consisted of field recording forms and procedures, and a data management facility programmed in dBase III PLUS® for IBM-compatible microcomputers. Details of this system have been published elsewhere (Lane et al. 1989).

The PMIS is an infestation-orientated system. An infestation is defined as an occurrence of a pest species on an identifiable unit or units of land. Infestations are documented according to program priorities and the practicalities of field operations-not all infestations are recorded. Infestation descriptions include location, infested area, pest plant cover and vegetation type (for weeds), estimated frequency of control required, a sign/activity rating, and the number of animals seen at the time of inspection. Treatment reports capture details of control work planned or carried out by CFL, and evaluations of particular treatments as necessary. Though used effectively in several regions where a focus of interest and leadership were present, the system was not universally implemented. The reasons for this were essentially administrative rather than technical. The PMIS has recently been redeveloped and trialed on CFL's statewide computer network.

DEVELOPMENT PROCESS

Redevelopment of the PMIS as a networked system offered advantages including improved security, easier maintenance, more powerful reporting, and integration with other Departmental information systems. The fundamental rationale and concepts of the original system have nevertheless been retained. A feature of the process has been extensive consultation with user groups (via questionnaires, and workplace visits) and relevant specialist staff within CFL. The project is overseen by a steering committee representing regional and head office management, the project team, and trade unions.

Software based on PRIME Information® was developed in-house by prototyping rather than from a rigid initial specification. Use was also made of GENB, a software development tool produced by the Australian Wool Corporation (Portelli, pers. comm.) and enhanced by CFL. GENB is a suite of programs written in PRIME Info/Basic® for input screen generation, data validation, and file maintenance which uses a parameter table for each screen. A standard GENB program handles operations relating to a screen (painting, refreshing, and sub-screen function) and related files (opening, reading, and writing). Validation of

character sets, dates, numeric ranges, and pattern matches is automated as is other file key validation, data display and enquiry, and on-screen help display for each input field. For unusual circumstances, a customising facility is available for reference to external procedural code either by reference to separate modules or by direct alteration of GENB source code.

CFL has developed a front-end system builder for creating files, defining data dictionaries, building on-screen help text, and for interactive development of GENB screens. This combination of software enables rapid prototype development and systems enhancement. Pilot trials are currently under way in two CFL regions to evaluate the system and guide the formulation of an implementation strategy for the whole state. The trials will run for about 5 months and have involved 23 field technical staff as well as keyboard operators, supervisors, managers, and planners.

FUNCTIONAL FEATURES

The PMIS is accessible in graded levels to registered users via a network of leased telephone lines. There are currently 52 sites around the state with leased line access and a further 12 with dial-up links to the network. These latter sites are suitable for data enquiry but not for live data entry. The host computer during development has been a PRIME 6550®. PMIS is designed to operate as a module of CFL's principal land administration system, L.I.M.S., and has data standards compatible with other departmental systems relating to finance, biological inventories, and chemical products. Infestations are geographically referenced permitting future interaction with other map-based data using CFL's geographic information system, ARC INFO®.

Report forms are A5 size carbonless duplicate sheets issued in pads to be carried in a vinyl 2-ring binder. The binder also contains notes on use of the forms and convenient lists of frequently used codes. Many items on the report forms are pre-coded to provide concise, standardised information. This approach simplifies field recording and data entry, and facilitates data validation at the point of entry. There are standard lists of pest species, cadastral land units, local government areas, methods of control and evaluation, materials, budget codes, and land use/vegetation types. Validation is achieved through reference to these files and the display on-screen of text corresponding to an entered code (or an error message if the entry is not found on the file), by character type and pattern matching, and numeric range checks. Relevant on-screen help is available at all points within the system and is also accessible by a keyword search facility.

A general report writing facility has been developed by CFL using PRIME'S Inform pseudo-English reporter. Users may build and save their own reports by simply choosing relevant items from displayed lists of files, records, and data items. This approach avoids complex and tedious typing and reduces the risk of errors. If an explanation of an item is desired prior to a choice being made, this can be viewed on-screen. Additional features of the output can be specified if required. A range of standard reports has also been provided. Reports can be viewed on the screen, sent to a network printer or directed to a hold file from where they can be transferred by electronic mail or downloaded to a microcomputer. The transactional data files of the PMIS are regionalised, so that field staff manage data relating to their own region only. Global reporting is possible.

DISCUSSION

Proposed enhancements include provision for the recording of the existence of other types of land degradation, creation of a reference file of local groups of landholders established to promote land protection activities, and provision of the facility to capture data relating to the release and monitoring of biological control agents. It is also intended to extend the reporting capability to provide a decision support system.

Future developments will include an interface with CFL's networked geographic information system. Currently, downloaded data can be processed using graphics and mapping software available on microcomputers. In the future, data from the PMIS could be analysed in relation to physical, biological, and economic information to aid the assessment of program priorities and contribute to integrated land management.

The principal challenges to successful adoption of the PMIS are the understandable scepticism of potential users, the intangibility of future benefits and competing priorities within the department. Early feedback from users in the pilot regions has been most encouraging. On the strength of these early indications, it is envisaged that the PMIS will in time play a significant role in operational planning and evaluation, budgeting, reporting, policy development, and research planning.

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