

PARKINFO: A GEOGRAPHIC INFORMATION SYSTEM FOR LAND MANAGERS

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Abstract

Queensland Parks and Wildlife Service (QPWS) an entity of the Environment Protection Agency, administers a large reserve system for which fire management is crucial. A customised agency geographic information system (GIS) known as ParkInfo, has become increasingly important to support innovations in fire policy and systems. Integrating fire zoning, fire history, vegetation and other data, ParkInfo provides a simple but powerful tool supporting fire planning, implementation and reporting.

Aimed at field-based ranger staff, many of whom have a limited knowledge of mainstream GIS, ParkInfo allows easy access to relevant GIS data through a simple to use interface. Custom built modules guide users through the process of recording fire and pest data, easing and standardising data capture. Reports are generated about individual fire or pest management activities, or about overall fire and pest management performance. Staff can visually interrogate numerous layers and undertake simple analyses aimed at aiding management. Specific modules enable the easy production of hardcopy maps and integration with global positioning (GPS) technology. The fire and pest data collected is extracted twice a year and merged to create a statewide database enabling reporting and analysis of trends. Significantly, ParkInfo captures fire history to aid future planning decisions.

ParkInfo has instigated organisational change within QPWS by providing access to GIS technology and providing tools for improved fire management. The application has been embraced to varying degrees by staff across the state and in many areas is now an integral component of land management.

QPWS, GIS, ArcView, fire history

Introduction

ParkInfo is a GIS designed for the QPWS land manager. It is a relatively simple to use tool to assist in planning land management activities and provides a means to access, integrate and visualise spatial and related data. Modules simplify and standardise the capture of fire and pest data and reporting modules help QPWS evaluate natural resource management performance (Kington and Drake 2005).

What are ParkInfo's objectives?

The objectives of ParkInfo are summarised below (from Brown et al. 2004):

- To provide QPWS land managers with a GIS that is accessible to basic computer users;
- To present a broad range of spatial data to assist in land management planning;
- To enhance park management capability by providing a powerful tool to integrate data;
- To provide a GIS with broad application for land management including infrastructure management, natural and cultural data inventories, planning and implementing land management and monitoring;
- To simplify and standardise the capture of natural resource management (NRM) data, initially focusing on fire and pests;
- To provide information about land management activities to agency information systems, to aid in evaluating park management performance; and
- Inclusion of select tools to interrogate data to aid in NRM planning.

Why ParkInfo?

QPWS is the largest land manager in the state of Queensland, managing a vast area of 14 829 440 ha. Effective management of protected areas, including infrastructure, fire, pests, ecosystems, species and resource inventories, requires spatial information (Kington and Felderhof 2001).

For many years access to spatial information within QPWS was variable. The transition of spatial information to the digital realm generated inequitable access, with regional and city centres able to benefit from the technological shift, while access to contemporary spatial information by those with direct land management responsibility (park and district bases) was generally poor.

Park and district bases that began to use GIS and GPS technology did so without agreed standards and procedures, raising concerns regarding data storage, consistency, duplication of effort, communication of information and an inability to roll-up data to evaluate park management performance (Beetson 2004).

Between 1998 and 2001 there was growing recognition among QPWS staff and executives of the need for improved business and NRM systems, and funds became available for their development. The adoption of a statewide fire policy and fire management system highlighted the need for supporting GIS. The then Queensland Department of Natural Resources had demonstrated a relevant application of technology with the PestInfo GIS system (Beetson 2004). These pressures culminated in the development of the ParkInfo Project Plan in March 2001 (Kington and Felderhof 2001).

How does ParkInfo work?

ParkInfo has been developed to be operational at remote locations. Given the size of Queensland, the geographic spread and remoteness of many staff, costs and size of the data sets and inconsistent network connectivity, it has not been plausible to have a networked or web based GIS accessible by land management staff. Consequently, ParkInfo runs on individual computers or across local servers (Beetson 2004).

ParkInfo is a customised extension of the commercial ArcView 3.3 GIS product. Aimed at field-based ranger staff, many with limited computer skills, ParkInfo substantially simplifies ArcView alleviating the need for specialist GIS skills. Modules for fire and pest management step users through an otherwise complex process for spatial and attribute data capture, allowing statewide consistency, the capture of mandatory information and recording of meta-data. The captured fire and pest data is extracted twice a year and merged into district, regional and statewide databases, enabling (mostly historic) reporting of management performance. Additional modules simplify production of hardcopy maps, labelling of features, building search queries, integrating GPS equipment and 'hotlinking' (linking non-spatial data such as reports and photographs).

Critical to the success of ParkInfo is a network of 'Configurers' supported by 'Administrators'. Configurers are intermediate GIS users responsible for developing ParkInfo 'instances', rolling the instance out to park bases, maintaining and updating instances, training field-based staff, verifying data about pests and fire, and rolling-up data biannually. ParkInfo instances are ready to use GIS projects covering a logical geographic aggregation of QPWS managed land or water. GIS professionals in central office and regional bases administer ParkInfo providing technical support to Configurers.

How is ParkInfo used to support Fire Management?

A number of tools are available to aid planning, reporting and implementation of fire management. As required by the QPWS Fire Management System, users can develop and keep track of planned burn proposals and record the history of wildfires and planned burns. Users can also plan future fire management, create reports about individual fires or overall fire management performance and compile fire action maps to aid field implementation.

Planned Burn Proposals

A custom-built module steps users through a process of adding or editing data for a burn proposal (refer to Figure 1). Spatial information is entered via GPS, by digitising on screen or by importing existing spatial data. Attributes are collected about burn objectives, responsible persons, estimated costs, required weather conditions, expected fire behaviour and potential risks and hazards.

Figure 1: Extract from the First Page of the ParkInfo Burn Proposal Form

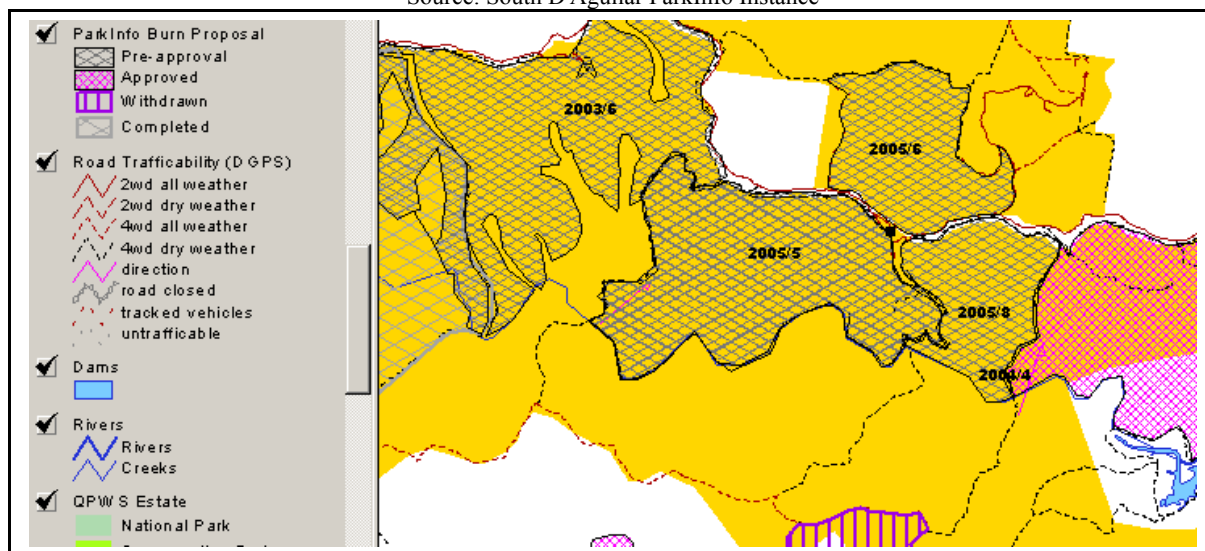
Source: South D'Aguilar ParkInfo Instance, Burn Proposal 2004/4 by John Ravenscroft

Planned Burn Program

A planned burn program is a series of burn proposals aimed at achieving fire management goals as expressed in fire plans. Land managers keep track of planned burn programs by displaying the approval status of proposals as shown in Figure 2. An annual meeting of key staff assesses the approval of burn programs.

Figure 2: Example Status of Burn Proposals

Source: South D'Aguilar ParkInfo Instance



To aid decisions with regard to priorities, timing and resources; and as an overview of upcoming planned burns, ParkInfo can generate printable summaries as shown below in Figure 3.

Figure 3: Extract of a Planned Burn Program Summary

Source: South D'Aguiar ParkInfo Instance

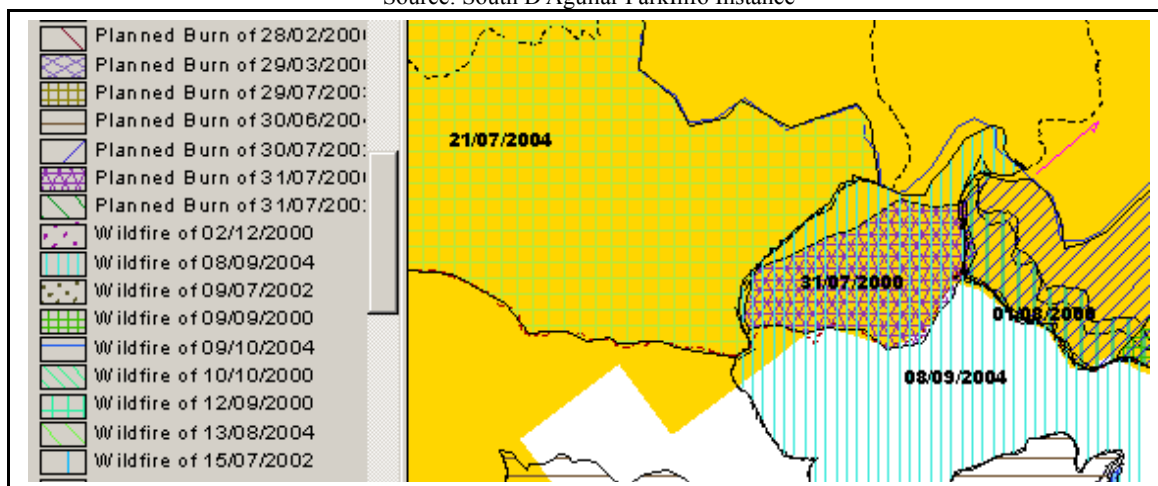
Proposal Number	Season	Name	Section/Location	Who will conduct the burn	Fire Management Zones	Proposal Area	Purposes of the burn	Estimated Staff Days (hrs/8)
2003/6	Autumn	D'Aguiar South Aggregation	East of 309 Barracks	QPWS	Conservation Zone	238	1 Conservation 2 Weed Management	17
2005/1	autumn	D'Aguiar South Aggregation	Dunnings Break D'Aguiar Forest Reserve	QPWS	Wildfire Mitigation Zone	332	1 Hazard Reduction 2 Weed Management 3 Conservation	16
2005/5	Autumn	D'Aguiar South Aggregation	Between Hell hole & Centre Road	QPWS	Conservation Zone	216	1 Conservation 2 Weed Management	16
2005/5	Autumn	D'Aguiar South Aggregation	Between Hell hole & Centre Road	QPWS	Conservation Zone	216	1 Conservation 2 Weed Management	16
2005/6	Autumn	D'Aguiar South Aggregation	North of 309 Barracks	QPWS	Conservation Zone	104	1 Conservation 2 Hazard Reduction	9
2005/7	Autumn / Winter	D'Aguiar South Aggregation	Between Scrub road and Black Soil Rd	QPWS	Conservation Zone	172	1 Weed Management 2 Conservation	9
2005/8	Summer	D'Aguiar South Aggregation	Hollmans and Centre road	QPWS	Conservation Zone	86	1 Conservation 2 Hazard	9

Fire reports

Users are guided through a module for adding or editing reports about wildfires and planned burns. Information is captured about the spatial location of the fire, accuracy of the data, persons conducting fire management, costs, labour, intensity of the fire, ecosystems burnt and the results of management objectives. Reports build into a fire history for each QPWS managed area (see example in Figure 4), and are rolled-up into a statewide QPWS fire history.

Figure 4: Example Fire History

Source: South D'Aguiar ParkInfo Instance

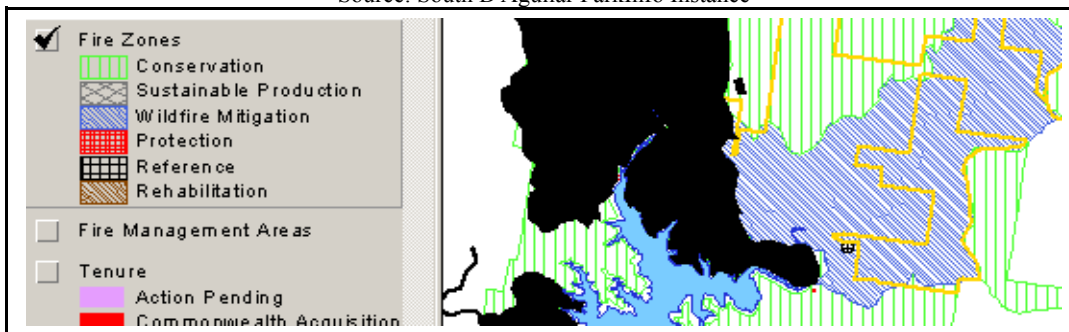


Fire Management Planning

Fire zones within ParkInfo spatially convey the management recommendations of fire plans. When tools to interrogate fire history are compared to zoning plans, ParkInfo can assist in planning future fire management. In Figure 5 below, the last 6 years of fire history (in black solid fill) is contrasted against wildfire mitigation zones (diagonal hatching). Wildfire mitigation zones are intended to mitigate the spread of wildfire, and in the example below, areas of wildfire mitigation zone that are not overlaid by recent fires (in black solid fill) are overdue for planned burns.

Figure 5: Example Application of Fire History to Wildfire Mitigation Zones

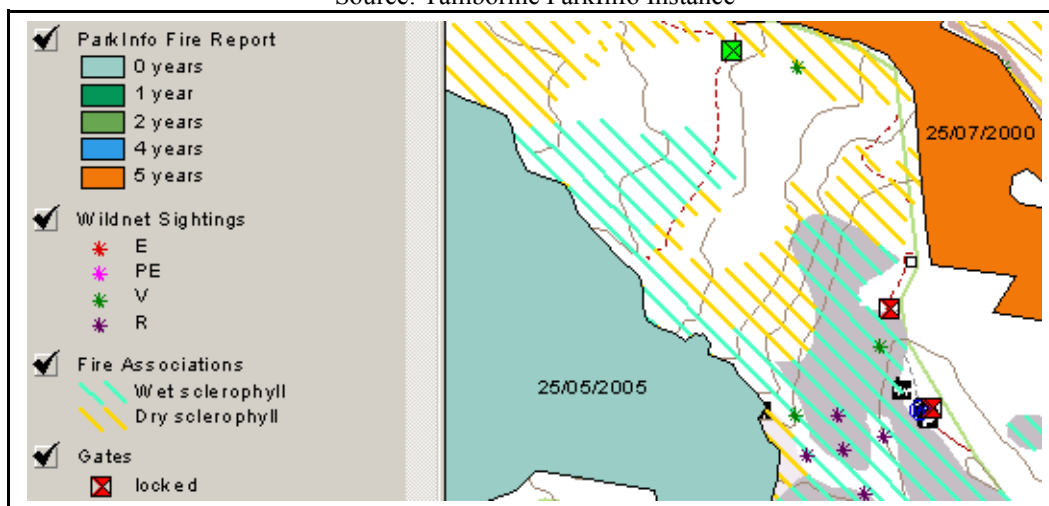
Source: South D'Aguilar ParkInfo Instance



In Figure 6 below, fire history (shown in solid fill) is compared to the recommended ecological fire regimes for vegetation associations (shown in hatched patterns). Biodiversity data (shown in grey and by asterisks) adds guidance to burn priorities and builds an appreciation of ecological requirements and constraints. Detailed data such as roads, management points, infrastructure, creeks and contours build an appreciation of practical concerns.

Figure 6: Example Application of Fire History to Conservation Zones

Source: Tamborine ParkInfo Instance



Summarising Fire Management

Statistics summarising fire management (Figure 7 below) can be generated at a park, district, regional or statewide level, providing an overview of fire management activities.

Figure 7: Extract of Statistics for Fire Reports

Source: Patricia Hanslow, Statewide ParkInfo Instance

1. Number of wildfires and planned burns:

	Wildfires	Planned Burns	TOTAL
Central	68	89	157
Northern	196	276	472
Southern	580	850	1430
Unknown	0	6	6
TOTAL	844	1221	2065

2. Total area burnt by wildfires and planned burns (ha):

	Wildfires	Planned Burns	TOTAL
Central	421455	70247	491702
Northern	6476882	1102214	7579096
Southern	615199	661179	1276379
Unknown	0	1706	1706
TOTAL	7513536	1835346	9348883

3. Total costs of fires:

	Wildfires	Planned Burns	TOTAL
Central	271156	192515	463671

Fire Action Maps

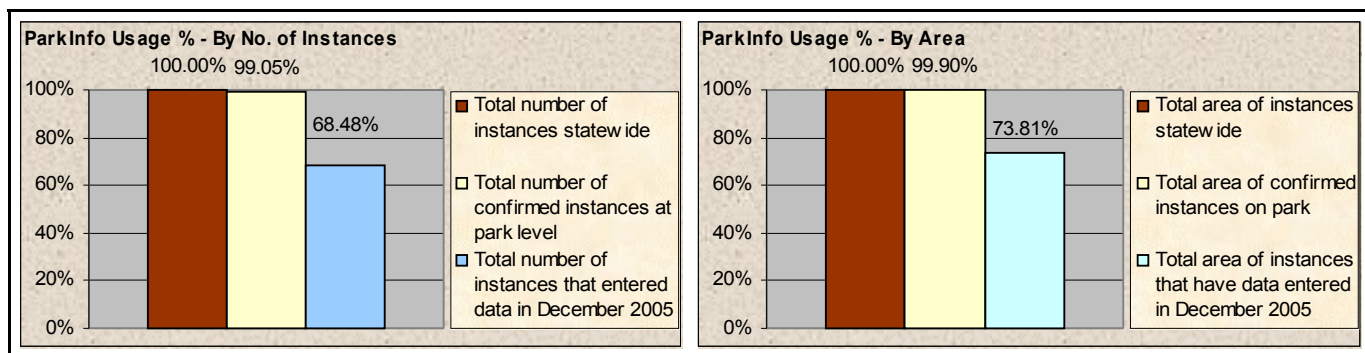
A customised module simplifies the production of printable maps, including fire action maps that are compiled to support emergency response and field operations.

To what extent has ParkInfo been utilised?

There are currently 422 ParkInfo instances across the state, nearly all of which (99%) have been rolled out to local management staff. As at December 2005, 68% of these (see Figure 8 below) have had fire and/or pest data entered, indicating a moderate uptake by park-based staff. As the sole indicator for usage and uptake, this figure is somewhat misleading as a number of reserves lack important fire and pest management issues so do not attract data entry effort. Looked at by area, 74% of QPWS managed estate has had fire or pest data added (see Figure 8), indicated that larger reserves are attracting a greater effort.

Figure 8: ParkInfo Uptake Statewide

Source: Patricia Hanslow, 6-3-06 based on December 2005 data roll-up



Anecdotally, ParkInfo has been well received by QPWS land managers who can readily appreciate its usefulness, and many locations use it regularly to support land management. However, there are still significant gaps where shortfalls in resources, support and relevant data curtail use.

Conclusion

With the technological transition to digital spatial data, ParkInfo provides an accessible portal for land managers. ParkInfo has instigated organisational change by providing access to GIS technology, standardising NRM data capture, providing useful management tools and reporting functions. The application has been embraced to varying degrees by staff across the state and in many areas is now integral.

Future development provides opportunities to explore partial use of web-based platforms, modules to capture a much broader range of data not limited to fire and pests, and to provide enhanced tools to aid land and water management.

References

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- Brown, R. et al. (2004). ParkInfo Version 1.2 User Manual, unpublished QPWS.
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