MONITORING HEATHLAND FIRES IN DORSET: PHASE 1

Report to:
Department of the Environment
Transport and the Regions:
Wildlife and Countryside Directorate

July 1999

Dr. J.S. Kirby[1] & D.A.S Tantram[2]

[1]Just Ecology
[2]Terra

Anvil Cottage, School Lane, Scaldwell, Northampton. NN6 9LD
email: terra@dial.pipex.com
web: http://www.terra.dial.pipex.com
Tel/Fax: +44 (0) 1604 882 673

Metadata tag

Data source title	Monitoring Heathland Fires in Dorset: Phase 1
Description	Research Project report
Author(s)	Kirby, J.S & Tantram, D.A.S
Date of publication	July 1999
Commissioning organisation	Department of the Environment Transport and the Regions WACD
Name	Richard Chapman
Address	Room 9/22, Tollgate House, Houlton Street, Bristol, BS2 9DJ
Phone	0117 987 8570
Fax	0117 987 8119
Email	research.wacd.doe@gtnet.gov.uk
URL	http://www.detr.gov.uk
Implementing organisation	Terra Environmental Consultancy
Contact	Dominic Tantram
Address	Anvil Cottage, School Lane, Scaldwell, Northampton, NN6 9LD
Phone	01604 882 673
Fax	01604 882 673
Email	terra@dial.pipex.com
URL	http://www.terra.dial.pipex.com
Purpose/objectives	To establish a baseline data set and to analyse these data to help target future actions
Status	Final report
Copyright	No ☐ Yes ☒ Terra standard contract conditions/DETR Research Contract conditions. Some heathland GIS data joint DETR/ITE copyright. Some maps based on Ordnance Survey Meridian digital data. With the sanction of the controller of HM Stationery Office 1999. OS Licence No. GD 272671. Crown Copyright.
Constraints on use	Refer to commissioning agent
Data format	Report
Are data available digitally:	No ☐ Yes ☒
Platform on which held	PC
Digital file formats available	Report in Adobe Acrobat PDF, Project GIS in MapInfo Professional 5.5
Indicative file size	2.3 MB
Supply media	3.5" Disk CD ROM

EXECUTIVE SUMMARY

Lowland heathland is a rare and threatened habitat and one for which we have international responsibility. Dorset has around 6000 ha of heathland that gives it the third largest area for an English county. Much of the recent decline in heathland area has slowed in recent years but there are many concerns over quality. In Dorset in particular there has been widespread concern that repeated incidences of fire have been diminishing the resource and threatening important heathland species. In July 1998 the Council of Europe's Bern Secretariat undertook an "on-the spot" appraisal visit to the Dorset heathlands. Part of the remit of the visit was to assess the effect that fires had on the conservation interest of the heathland, particularly those areas lying close to or within the large urban conurbation of Poole and Bournemouth where the problems were thought to be most severe. In anticipation of the Standing Committee's recommendations the European Wildlife Division of the Department of the Environment Transport and the Regions decided to commission independent research to draw together existing records of heathland fires. The main purpose of this research was to establish a baseline data set and to analyse these data to help target future actions and produce proposals for recording future fire events. This report is a product of the research and concentrates on the collation of a reference data set and an analysis of this information. Proposals for recording future fire events are covered in the separate Phase 2 report.

A large number of records of heathland fires were gathered from a variety of relevant organisations, the vast majority of these records were generated by the Dorset Fire and Rescue Service. The resulting data set contained 3333 incidents for the period 1990-1998 across Dorset. Data were analysed both statistically and spatially and results presented in terms of temporal and geographic characteristics. Data collection methods and standards varied across different organisations and there were some problems with data quality, most striking were locational errors in grid references.

The results showed that uncontrolled fires can occur at any time of the year but are most frequent between April and August when, unfortunately, they are likely to cause most damage to heathland vegetation and wildlife. Fires were more likely to occur at weekends than weekdays, during school holiday periods rather than term time and during the afternoon and early evening compared to other times of the day. Fires occurred on nearly all patches of heathland over the study period with higher concentrations on heathlands within or near to conurbations. It was not possible to quantitatively assess the ecological impact fires had had upon Dorset's heathlands due to lack of information. However, it is clear that a number of heathland sites have been subject to substantial numbers of fires and that these may have caused significant ecological disturbance and damage.

I. ACKNOWLEDGEMENTS

A great many people have provided help with this project. First and foremost, we are grateful to Richard Chapman for expertly guiding the project and Mark Taylor, Alison Briggs and Vic Jennings for assisting him at the Department of the Environment Transport and the Regions. We also thank our collaborators, Professor Nigel Webb and Rob Rose of the Institute of Terrestrial Ecology's Furzebrook Research Station, George Boobyer of Augur Information Systems and Mark Stevenson of the Northmoor Trust for contributions of ideas, informed comment and the tackling of specific tasks for the project.

Questionnaire, fire or other data, or expert comment, was provided by many: AFV Gunnery School, Lulworth Camp (Mick Burgess); Bournemouth Borough Council (S Clarke); Christchurch Borough Council (P Holloway); Dorset County Council (Stuart Crane, Phil Sterling); Dorset Environmental Records Centre (Alison Stewart); Dorset Fire and Rescue Service (Alun Morgan, Andy Motteram); Dorset Police (Mike Humphreys, Simon Merry); Dorset Wildlife Trust (Rob Brunt, Andy Fale, Lesley Haskins); East Dorset District Council (Phil Baarda, Phil Thompson); English Nature (Andrew Nicholson); Forest Enterprise (Alison Field, Harold Gillen, Richard Mihalop); Herpetological Conservation Trust (Sandy Dolbear); Poole Borough Council (Jez Martin, Nick Woods); Royal Society for the Protection of Birds (Neil Gartshore, Nigel Symes). We are grateful to all for the kind assistance so readily provided and apologise to anyone we have unknowingly omitted.

II. CONTENTS

Figures

Tables

Maps

1 INTRODUCTION

Lowland heathland is a rare and threatened habitat that supports a range of characteristic plants and animals, some of which are rare and many of which are in decline (Moffat, 1994). The rare species present on heathlands include Marsh gentian, Marsh clubmoss, Dorset heath, the Sand lizard, Smooth snake, Silver-studded blue butterfly, Raft spider, Small red damselfly, Dartford warbler, Woodlark and Nightjar. Overall, heathlands support an abundance of Red Data Book plants and animals and numerous species afforded the highest priority for protection with the UK Biodiversity Action Plan (HMSO, 1995). Species protection is therefore of fundamental importance across the lowland heathlands of the UK.

Heathland habitat was once more extensive in England than it is today. Indeed, only one sixth of the heathland area present in 1800 now remains (HMSO, 1995). Threats to lowland heathland include the decline of traditional management, habitat fragmentation and disturbance and, to a lesser extent, agricultural improvement. In the past losses were to urban and industrial development, agriculture and forestry. Controlled burning was formally an important technique in the management of heathland in Europe. Together with other traditional methods of heathland management, such as grazing, turf-stripping and cutting of scrub and bracken, burning prevents tree and scrub colonisation, halts degeneration of the shrub layer and maintains low soil nutrient concentrations (Webb & Haskins, 1980). Today, however, a significant problem is that most fires on lowland heaths are uncontrolled, being either accidental or caused deliberately, particularly near urban areas (Farrell, 1993). Whereas controlled burns are carried out in early spring and are intended to be small, fast and of low intensity, uncontrolled fires tend to occur later in the season and may cover a large area and burn intensely for a large time. Additionally, rates of re-colonisation after fire can be slow where large areas have been burnt (Bullock & Webb, 1995). These uncontrolled fires may therefore destroy all above ground vegetation, burn deeply, cause loss of nutrients and destroy invertebrate and reptile populations. Uncontrolled fires are generally considered to be harmful and to create conservation problems, although this has not been extensively researched (Bullock & Webb, 1995).

Dorset's heathlands once covered over 40,000 ha and supported a small but diverse local economy. Traditional management encouraged and maintained a rich variety of heathland wildlife but the heathland areas that remain today are now fragmented and tend to be much smaller than in the past. Overall, only an estimated 6100 ha of heath remain in Dorset today (Veitch *et al.* 1995), which represents the third largest area of heathland for an English County (Moffat, 1994). Together with heathland in other counties this heathland resource has been recognised as having considerable international importance by the Bern Convention and the European Union's Habitats and Species and Birds Directives. Dorset heathlands are also represented with other designations, including Ramsar site status and six National Nature Reserve sites. About 95% of the Dorset heathland area has been notified as SSSI (Site of Special Scientific Interest).

With a large urban population nearby, Dorset's heathlands are particularly vulnerable to fire, started either deliberately, or as a result of carelessness. Here, as elsewhere, uncontrolled fires are perceived to be a problem for lowland heaths - resulting in loss of habitats and species, contributing to habitat fragmentation and disturbance, and precipitating serious management problems with post-fire invasive species such as bracken. Over the last few years, this has triggered international concern over the threat of fire to Dorset's heathlands. In July 1998 the Council of Europe's Bern Secretariat undertook an "on-the spot" appraisal visit to the Dorset heathlands. Part of the remit of the visit was to assess the effect that fires had on the

conservation interest of the heathland, particularly those areas lying close to or within the large urban conurbation of Poole and Bournemouth where the problems were thought to be most severe. In anticipation of the Standing Committee's recommendations the European Wildlife Division of the Department of the Environment Transport and the Regions (DETR) decided to commission independent research to draw together existing records of heathland fires. The main purpose of this research was to establish a baseline data set and to analyse these data to help target future actions and produce proposals for recording future fire events. The objectives of the research were to:

i. Establish the extent of existing records of heathland fires held by local bodies.

ii. Collate and analyse existing records, about the time, location and causes of fires as well as the nature and extent of the damage.

iii. Identify any existing patterns or trends from existing records.

iv. Devise a simple, standardised but effective means of collecting information on future heathland fires.

v. Consider and make recommendations on how that information should be collected, co-ordinated and disseminated.

vi. Identify any additional costs involved in implementing those recommendations.

This report describes the work primarily undertaken to address the first three of these objectives - Phase 1 of the study. Whilst information was also collected to help fulfil the remaining objectives during the course of the Phase 1 work, a further final report will focus more specifically on objectives iv-vi.

2 METHODS

2.1 Data collation

Working from target contacts supplied by DETR and English Nature, fifteen organisations were contacted by telephone, primarily to ascertain the volume of data they held on heathland fire events in Dorset. A summary of this first consultation is provided in Table 2.1.

Table 2.1: Organisations identified as potential fire event data holders and summary responses on contact.

Organisation	Contact(s)	Summary response
AFV Gunnery School, Lulworth (AFV)	M. Burgess	No records
Bournemouth Borough Council (BBC)	S. Clarke	No records
Christchurch Borough Council (CBC)	P. Holloway	No records
Dorset County Council (DCC)	P. Sterling	Hold a few records, for minor incidents
Dorset Environmental Records Centre (DERC)	A. Stewart	No records
Dorset Fire and Rescue Service (DFRS)*	A. Morgan, A. Motteram	Extensive records
Dorset Police (DP)*	S. Merry, M. Humphreys	Extensive incident records, in support of DFRS
Dorset Wildlife Trust (DWT)*	L. Haskins, R. Brunt; A. Fale	Hold records for DWT sites
East Dorset District Council (EDDC)*	P. Baarda, P. Thompson	Hold records for EDDC sites
English Nature (EN)	A. Nicholson	Hold records, for National Nature reserves since 1976. Have also collated other records
Forest Enterprise (FE)*	A. Field, H. Gillen, R. Mihalop	Hold records for FE/FC sites
Herpetological Conservation Trust (HCT)*	K. Corbett, S. Dolbear	Hold records for HCT sites
Poole Borough Council (PBC)*	N. Woods, J. Martin	Detailed records for Canford Heath and some records for other sites
RAC Centre, Bovington Range (RAC)	G. Preston	No records
Royal Society for the Protection of Birds (RSPB)*	N. Symes, N. Gartshore	Hold records for RSPB sites

From these results a subset of eight organisations (marked * above) were selected for detailed visits. The organisations selected were likely to provide the most information on heathland fires in Dorset. For each selected organisation, structured interviews were conducted in order to collect standardised information on a variety of topics including:

- The types of data held and the reasons for collecting them.
- Spatial and temporal extent.
- Details of the variables recorded.
- Storage and access details.
- Quality assurance and data security procedures.
- Future plans for data collection.
- The availability of the data for the current project.

Responses were collected by means of a purpose-designed questionnaire (Appendix 1). Completed questionnaires for the eight organisations are provided in Appendix 2. The responses were evaluated to identify the most valuable of the data sets potentially available for the current project. From the eight organisations interviewed, data were requested, for the years 1990-1998 inclusive, from seven; all except DP whose records for heathland fires were not easily accessible and would add little to those of DFRS. The data held by EN for National Nature Reserves were also requested. In each case the following variables were requested:

- Heath name.
- Sub-location name (i.e. location on the heath).
- Six or eight figure grid reference for either the fire event or the heathland site.
- Positioning (type) of grid reference (either central for the fire or central for the heath).
- Date.
- Day of the week.
- Approximate time of start of fire.
- Approximate time of end of fire.
- Extent of burn (in m^2 or ha).
- Cause (accidental or malicious, where known, and associated details).
- Any explanatory notes (additional information relevant to the objectives of the current project - e.g. suspected reason for the fire, impact on flora/fauna).

A summary of the responses to these data requests is provided in Table 2.2. Only three organisations provided >100 data records (DFRS, FE and PBC), with DFRS providing the bulk (86.5%) of all of the data records obtained (n=3438). For DFRS, the extraction of records was a lengthy and complex process. These records were stored within a number of different recording systems used over the years and, in most cases, shared the same database code as a number of other small fire events. The records for heath fires were mixed with records for fires involving grasslands, railway embankments, roadside verges, single trees *etc.*, so called "code 3" fires.

DFRS personnel first extracted all possible fire records applicable to heathlands (>5000), then manually checked these against the original fire incident reports. They retained all records that were either confirmed as heathland fires or were very likely (i.e. in the right location or indicated by descriptive notes) to be (n=2925). To each record, they added the information requested for this study that was not already in the DFRS database, such as heath name, grid reference for the heath, day of the week, and any further explanatory notes that seemed relevant. Unfortunately, DFRS records for the years prior to 1993 could not be extracted within the time available because they were held in bespoke statistical software that is no longer supported. The information supplied was provided in MS Access format and was for the period 1/1/93 to 4/12/98.

Table 2.2: Source and extent of fire event records for the Dorset heathlands collated for this project, showing total records and yearly breakdown.

Organisation	No. records	Years included								
		90	91	92	93	94	95	96	97	98
DFRS	2925	-	-	-	308	337	1048	500	449	283
DWT	19	1	1	1	2	2	5	3	1	3
EDDC	3	-	1	1	-	-	1	-	-	-
EN	57	38	5	3	2	1	2	1	4	1
FE	102	11	12	15	7	2	40	7	8	-
HCT	0	-	-	-	-	-	-	-	-	-
PBC[1]	326	-	7	9	19	19	205	38	13	16
RSPB	6	-	-	1	1	1	-	-	-	3

[1] Note that Canford Heath is the only PBC site consistently recorded across all years (1991-1998). All other PBC sites were included in 1995 only. All years PBC data were used in the analyses.

2.2 Data preparation

All of the fire event data received were either entered or transferred to an MS Excel® spreadsheet, with a code added to identify the source of the record (*i.e.* the supply organisation). A few records (n=10, for Ringwood Forest, Ashley Heath and Moors Valley Country Park) pertained to Hampshire so these were removed from the data set. The next task was to eliminate duplicate records. This occurred, for example, when more than one organisation (*e.g.* DFRS and PBC) attended and made a record of a particular fire. For such cases, the information from each entry was used to compile a new record for that event. In total 48 duplicate records were removed, leaving 3333 for analysis.

To obtain as complete and as accurate a set of records as possible, further work was required for a number of the variables collected in the data set. Heath names were standardised (they sometimes varied between organisations) and grid references were checked for accuracy. The positioning of each grid reference was coded, either as "fire", "site" or "sub-site", being the central points of the fire event, heathland site or sector of the heath (where recorded), respectively. The grid references used in preference were those for the central part of the fire event, although these had been recorded infrequently (8.9% of records). Otherwise, the grid references used were for the heath as a whole or for "compartments" (sectors) of a heath, where sub-site codes have been used (*e.g.* often for Canford Heath).

The dates of fire events were not always recorded accurately. Sometimes only the month or year of the incident was recorded, either through lack of systematic recording or where fires had been discovered after they started. These records were retained, as they would contribute to analyses not requiring an accurate date. Days of the week (*i.e.* Monday, Tuesday *etc.*) were added where this information was missing. This was not possible where the date of the fire was not recorded.

An estimated start time for the fire was recorded for 94.4% of the fire incidents in the data set but the end time was never recorded. Thus, the approximate duration of each fire event could not be calculated. A variety of different measurements had been used to estimate the extent of the area burnt by a particular fire. These were converted to hectares - the standard area unit chosen for analysis.

Fire events were often classified as "accidental" or "malicious" in the records supplied but the notes provided with each record often indicated that the coding for cause was incomplete or inconsistent. Thus, the notes themselves were used to categorise the known or likely cause of the fire as follows: all records where details of the cause were included (only 6.5%) were assigned to one of these categories.

Set fires	**Other fires**
Suspected arson	Discarded smoking materials
Bonfires	Lightning
Camp fires	Property fire
Habitat management	Spark from railway
Burning of refuse	
Destruction of vehicle	

One of the original intentions of the study was to assess the ecological impact of fire. In a few cases the notes field from the data supplied contained information on ecological effects (*e.g.* "fire mainly in gorse", "dead snakes found" *etc.*). This type of "ecological detail" proved sparse for many of the vegetation types and was recorded only rarely for animals. There was only one reference to birds, one reference to amphibians and just seven mentions of reptiles (sand lizard, smooth snake and slow worm) out of 3333 records and therefore these data proved unsuitable for analysis.

2.3 Data analysis

2.3.1 Statistical analyses

All statistical analyses were performed using Minitab for Windows® Release 12. Statistical examination of yearly, month, daily and time patterns in the frequency of fire events was undertaken using χ^2 analyses, with one- or two-way comparisons.

On the recommendation of consultees, we considered the hypothesis that the patterns of occurrence for fires might differ between either public or school holiday periods and work/term-time periods. In all cases using data from all years combined, this was investigated by:

- Using the dates of public holidays (weekends excluded) and those one week before each public holiday, comparing the frequency of fire events between holidays and non-holiday periods.
- Using the dates of individual school holidays and those for the equivalent time period immediately before each, comparing the frequency of fire events between holidays and non-holiday periods. Individual school holidays were defined as follows:
  - Autumn half-term - usually 1 week in late October/early November
  - Spring half-term - usually 1 week in mid-February
  - Easter - usually 2 weeks in late March/early April
  - Summer half-term - usually 1 week in late May/early June
  - Summer holiday - first two weeks only - usually late July/early August
- Combining the data from the individual school holiday comparisons (above) for an overall comparison of the frequency of fire events between school holidays and non-holiday periods.

Such an approach standardised the number of holiday and non-holiday dates used for each of the comparisons, and minimised any seasonal effects because only short time periods were used. The Christmas/New Year break was not assessed because of the very low frequency of fire events at this time of year.

2.3.2 Geographical data

Geographical analyses were carried out using MapInfo Professional® Version 5 and Vertical Mapper® Version 2 Geographical Information System (GIS) software. The following data sets were created/imported for use in the project GIS:

- **Fire event database** – created from fire event data collated for this project and as described above. The 3333 fire events in the database were imported as a point coverage from x/y co-ordinates using the British National Grid (BNG) co-ordinate system.

- **Heathland vegetation data** – based upon the 1996 Dorset Heathland Survey by ITE and RSPB (Rose *et al.* 1999) and generated from data supplied by ITE's Furzebrook Research Station. The survey was based upon 200x200m grids aligned with the BNG. Field survey was conducted in 1996 and recorded information in a variety of categories including heathland vegetation type/area and whether vegetation was recently burnt. The data were supplied in an Excel® spreadsheet with x/y co-ordinates. A 200/200m vector grid was generated in MapInfo using a MapBasic program and labelled with BNG co-ordinates. The Heathland data were then attached to the grid with a SQL query – thereby producing a new spatially referenced data set.

- **Heathland 'sites' data** – based upon algorithms developed by ITE for their 1996 Heathland survey it was possible to assign 200m grid squares to contiguous areas – thereby representing heathland 'sites' (ITE, 1989).

- **Topographic data** – Ordnance Survey Meridian™ data were supplied by DETR. These data were converted from NTF format to MapInfo and provided contextual information such as administrative boundaries, coastline, roads, built-up areas etc.

- **Built-up areas** – A region coverage of built-up area was generated from the DLUA feature codes in the Ordnance Survey Meridian™ data. Polylines were closed to regions and adjacent polygons combined to provide a vector data set for analysis.

- **Topography** - Ordnance Survey Land-Form Panorama™ data were supplied by DETR. These data were converted from NTF format to MapInfo and provided a 1:50,000 digital height data set.

- **Designated boundaries** – A data set of digital designated boundaries was supplied by English Nature and contained boundaries for Ramsar, SAC, SPA, NNR and SSSI sites as of September 1998. There are known boundary changes to Dorset heaths: Dorset Heaths (Purbeck & Wareham) & Studland Dunes SAC; Dorset Heathlands SPA and Dorset Heathlands Ramsar in October 1998 but digital boundaries are not yet available.

2.3.3 Geographical analyses

Using the data sets described above the following geographic analyses were conducted:

- **Fire event distribution** – the fire events data were plotted as a point coverage to show density of occurrence. Many data points were co-incident (where many fire events were attributed to a site centroid grid reference) so a further thematic analysis for density was carried out (see below). For further analysis and location profiling in Vertical Mapper the co-incident points were aggregated using point aggregation tools in Vertical Mapper.

- **Fire event density** – densities were depicted in four ways. Firstly counts were made of number of fire events within 5km squares and these were thematically mapped. Secondly, the data were converted into a grid in Vertical Mapper using a location profiling model and thematically mapped as a probability surface representing contours of frequency of burn related to geographical spacing. Co-incident points were counted during the point aggregation process (see above) and this count was used as a distance-decay function in the location profile model – thereby representing (and retaining) the higher frequency of incidents in some locations. Thirdly a natural neighbourhood analysis was used to create Theissen Polygons for fire event points (a point density surface) – each representing an equal frequency of burning. However, this did not appear to generate any useful results and appeared less helpful than the location profiling exercise. Fourthly, a set of heathland 'sites' were generated using the grouping code supplied by ITE. The ITE data were then used to calculate the area of heathland vegetation within each 'site' and the fire event data used to count the number of fires occurring within the study period within each 'site' area of heathland. This produced a 'league table' of heathland sites with density of burning.

- **Fire incidence in relation to built-up areas** – carried out using the fire events data, designated boundaries data, built-up areas data set and the ITE heathland vegetation data. The designated boundaries data for Sites of Special Scientific Interest (SSSI) were overlayed with the heathland vegetation data in the project GIS to calculate the total area of heathland vegetation in each SSSI. To ensure the data set comprised mainly heathland SSSIs those with over 20% heathland vegetation were selected for further analysis. Each SSSI site was buffered by 500m (maximum likely access distance for average users of greenspace, Harrison *et al*, 1995). The number of fires in each locality was divided by the area of search to adjust for different catchment areas. Finally, as some buffers overlapped any fires that occurred in two buffers were manually allocated to one parent site based upon site name in the fire events records to prevent lack of independence problems. The percentage of built-up land within each ring buffer was calculated and plotted against the number of fires occurring in each heathland SSSI and its buffer. Thus this test sought to test the hypothesis that heathlands adjacent to a higher developed land were likely to have more fires than those with more rural locations.

- **Fire incidence in relation to topography** – The OS Panorama™ contour data were used to build a grid surface for altitude in Vertical Mapper. The surface was then modelled to analyse for slope and aspect respectively. The fire event data were overlayed and intersected with slope and aspect regions generated from the slope and aspect grids. No relationships were found between fire event location and slope or aspect. This could be because there is no relationship or because the data were of an insufficient resolution to depict any relationship. Fire event data were rarely referenced to the position of the fire but most commonly referenced the centroid of the site within which they occurred. The Digital Terrain Model (DTM) available was based upon a 50m grid spacing which may not adequately represent the topographic variation of the Dorset heathland sites.

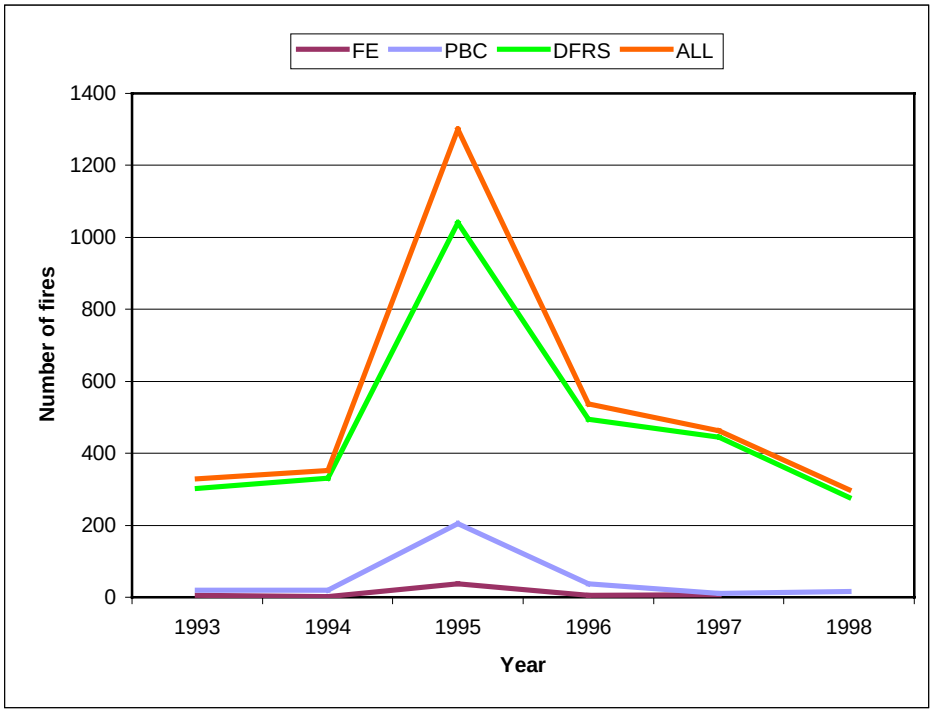
- **Fire incidence in designated areas** - The data set of digital designated boundaries was used in conjunction with the fire event data set to produce counts of fires within SSSIs, SACs, SPAs and Ramsar sites.

3 RESULTS

3.1 Timing of fire events

Relatively few data were obtained for the years 1990-1992 inclusive, only 1.6% of the total records. After this time the total number of records has varied significantly year-on-year (χ^2 = 1320.88, P<0.01) with a very pronounced peak in 1995 (Figure 3.1). The 1995 peak was evident in the data provided by DFRS, PBC and FE, the three main information sources.

Figure 3.1: Total numbers of unplanned fires on the Dorset Heathlands, 1993-1998. Trends based on the records provided by Forest Enterprise (FE), Poole Borough Council (PBC-all sites) and Dorset Fire and Rescue Service (DFRS) are shown, together with the overall trend using all records.



The monthly pattern of fires for 1995 was markedly different from other years (Figure 3.2). Both the April and August peaks were very pronounced in this year, with an unusually high incidence of fires in the intervening months also. Considering all years combined, fire events occurred in all months of the year (Figure 3.3), with significant variation between months (χ^2 = 1445.46, P<0.01). The total number of fires overall increased sharply through to April, then declined. There was a second peak in August, after which the numbers of fires per month fell sharply. Overall, 16% and 18% of fires occurred in April and August, respectively. For 1995, the August peak was much larger than the April peak (Figure 3.2) but if this year is excluded the April peak is the largest (Figure 3.2 & 3.3).

Figure 3.2: Total numbers of unplanned fires on the Dorset Heathlands each month and shown separately for each year from 1993-1998.

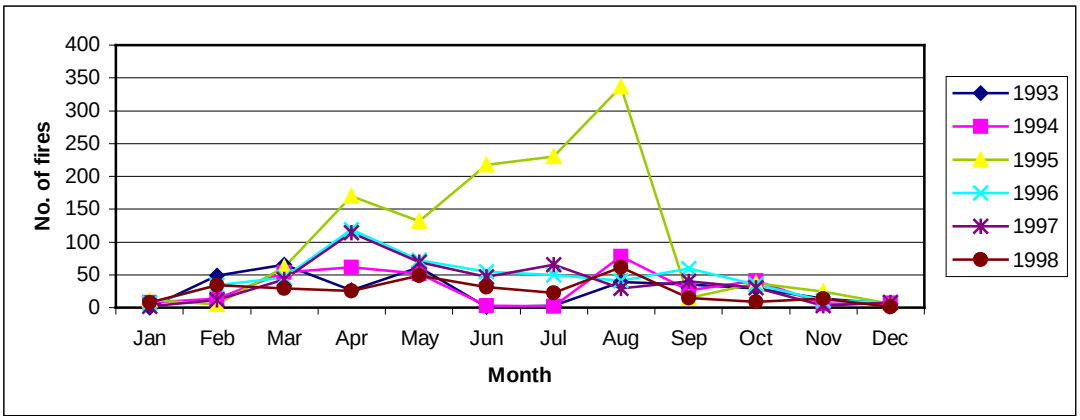
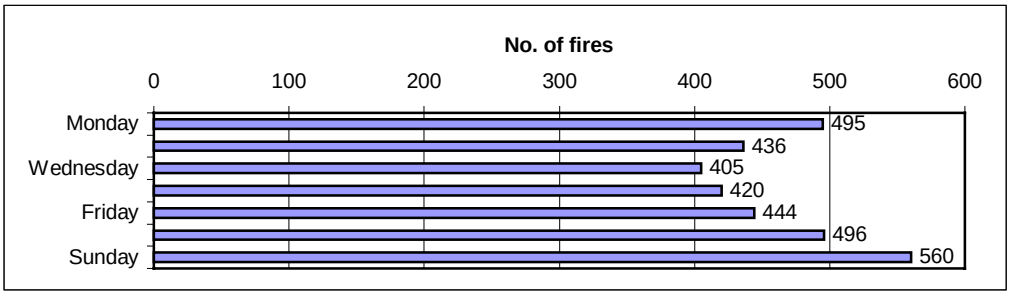


Figure 3.3: Total numbers of unplanned fires on the Dorset Heathlands per month: all years combined (1990-1998) and for all excluding 1995.

Figure 3.4: Total numbers of unplanned fires on the Dorset Heathlands according to day of the week. Based on all years from 1990-1998.



Although varying significantly across days of the week (χ^2 = 38.25, P<0.01), fires occurred frequently on any day (Figure 3.4). However, there were 13% and 22% more fires on weekend days (Saturday and Sunday) compared with the Monday/Tuesday period (χ^2 = 7.86, P<0.05) and Thursday/Friday period (χ^2 = 19.20, P<0.01), respectively.

The weekday/weekend effect was not consistent throughout the year, however. Depending on the days chosen for the comparisons, there were more fires on weekend days only in winter and possibly in Spring (Table 3.1). The numbers of fires on weekends versus weekdays was similar in both summer and autumn.

Table 3.1: Comparisons of the numbers of fires on weekends and weekdays (Monday/Tuesday and Thursday/Friday) at different times of year. "Winter" comprises January to March and October to December inclusive. Significant differences are shown in bold.

Time of year	**Weekend fires**	**Monday/Tuesday fires**	χ^2	P
Winter	257	156	24.70	**<0.001**
April/May	307	303	0.026	Ns
June/July	225	225	0.000	Ns
August/September	267	247	0.778	Ns
Time of year	**Weekend fires**	**Thursday/Friday fires**	χ^2	**P**
Winter	257	211	4.521	<0.05
April/May	307	222	13.658	<0.001
June/July	225	195	2.143	Ns
August/September	267	236	1.911	Ns

The incidence of fire events was not significantly greater on public holidays compared with the equivalent days just one week previous (Table 3.2). However there were marked differences between school holiday periods and school term-time *periods*, with more fires in the holiday periods. In all cases there were more fires in holiday periods than in non-holiday periods. The differences were significant for school holidays overall and three out of the five comparisons made (Table 3.2).

Table 3.2: The numbers of unplanned fires on the Dorset Heathlands during non-holiday and holiday periods and the results of tests for statistical significance. Significant differences are shown in bold. See methods for further details.

Type of holiday	**Number of fires**		**Statistical significance**	
	Non-holiday	Holiday	χ^2	P
Public holidays	86	93	0.27	0.60
School holidays	251	454	**58.45**	**0.01**
Autumn half term	21	42	**7.00**	**0.05**
Spring half term	24	37	2.77	0.10
Easter	89	164	**22.23**	**0.01**
Summer half term	55	68	1.37	0.24
Summer holiday	62	143	**32.01**	**0.01**

Fires occurred during all hours of day and night (Figure 3.5), with the numbers overall at their lowest between 02:00 and 06:00 and at the highest values between 13:00 and 20:00 (afternoon and early evening). There was a marked peak at 16:00-17:00 for all records combined. This was present also in a sub-set of records for the school terms, whilst there appeared to be less of a pronounced peak in the records for school holiday periods, with a high occurrence of fires between 13:00 and 20:00 (Figure 3.5).

Further analysis of the fire records against time of day showed that there was significant variation in the frequencies of fires between six periods of the day (Figure 3.6). A 15:00-18:00 peak in fire events was significantly greater than that for adjacent periods of the day: 11:00-14:00 (χ^2 = 127.68, P<0.01) and 19:00-22:00 (χ^2 = 118.57, P<0.01). In this analysis, there was little difference in the pattern of occurrence between school holiday and term-time periods, though with notably more fires occurring at all periods of the day in the school holidays (Figure 3.6).

Figure 3.5: Total numbers of unplanned fires on the Dorset Heathlands according to time of day. The comparison between term time and school holidays is based upon a subset of the total data – see methods for details.

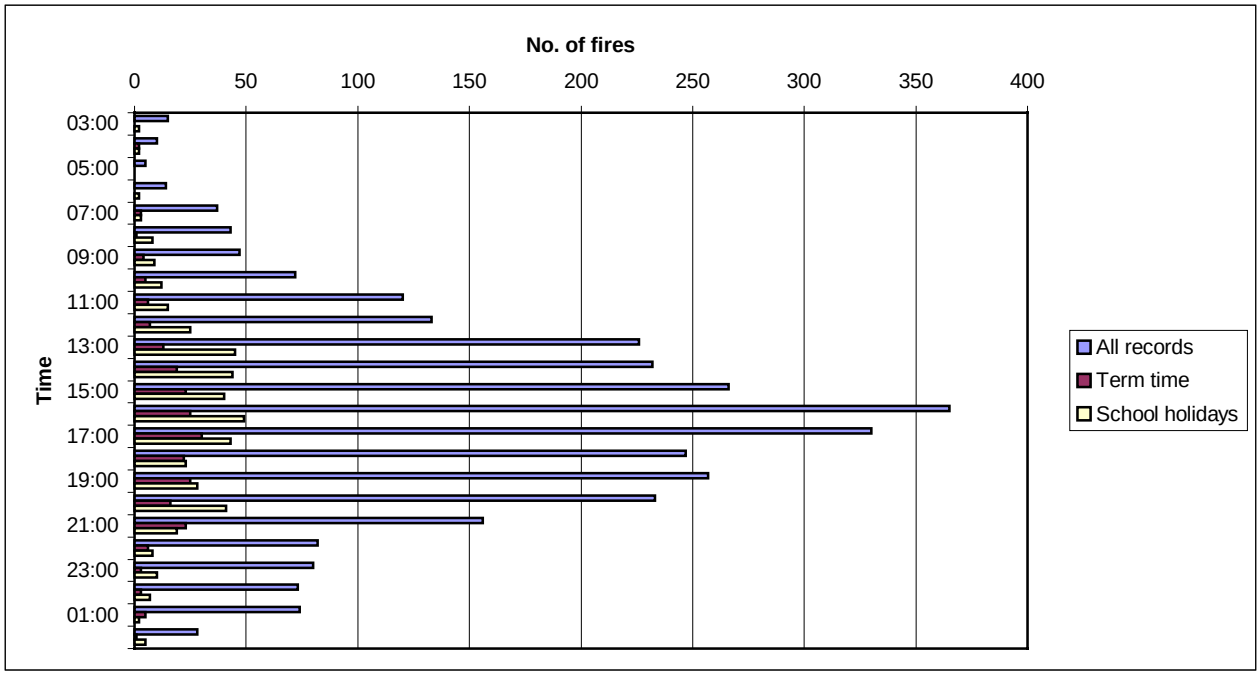
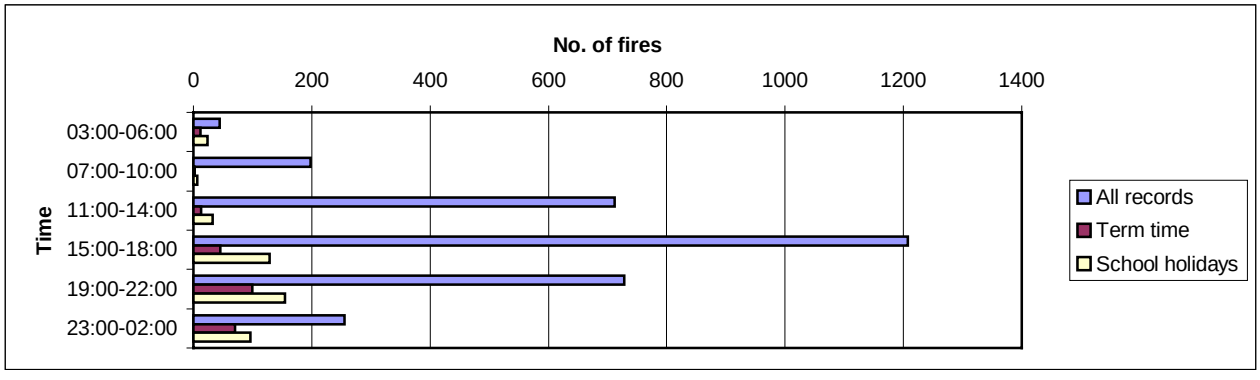


Figure 3.6: Total numbers of unplanned fires on the Dorset Heathlands according to periods in the day including school holiday and non-school holiday (term time) periods. The comparison between term time and school holidays is based upon a subset of the total data – see methods for details.



3.2 Spatial variation

3.2.1 Statistical analyses

A total of 112 separate localities were represented in the fire event data set based upon heath names provided with the fire records. As there is no widespread use of standard site names these heath names differ from SSSI names, therefore Table 3.3 also shows the SSSI site names for areas of land co-incident with the fire records. At 86 of the 112 localities (76.8%) recorded there had been fewer than 20 fires during the nine years from 1990-1998. There had been fewer than 5 fires in total at 61 of these 86 localities (*i.e.* 71%). Twenty or more fires occurred at a total of 26 localities (defined at the "key sites"), with by far the most

Table 3.3: 'League' table of Dorset heathland sites with more than 20 fire events during the 1990-1998 period. Total records plus number of repeat burns of the site[1] per year, month[2] and day (date) are shown. A dash (-) is shown where areas are not in or near a SSSI.

Key sites (Fire records name)	SSSI Name	Total Records	Yearly Maximum	Monthly Maximum	Daily Maximum
Canford Heath	Canford Heath	613	227	97	12
Kinson Common	Turbary & Kinson Commons	320	114	31	6
Bourne Bottom	Bourne Valley	279	79	16	3
Turbary Common	Turbary & Kinson Commons, Bourne Valley	204	90	32	4
Talbot Heath	Bourne Valley	185	95	31	5
Upton Heath	Upton Heath	184	54	14	2
Ham Common	Ham Common	181	86	24	6
Rushcombe Bottom	Corfe & Barrow Hills	115	44	16	4
Ferndown Common	Ferndown Common	113	27	11	3
Parley Common	Parley Common	86	23	8	4
Redhill Common	-	83	37	15	4
Mannings Heath	-	70	18	18	2
Turlin Moor	Poole Harbour	69	36	17	3
St Catherine's Hill	Town Common	58	31	9	3
Dewlands Common	Verwood Heaths	49	15	6	2
Boveridge Heath	Verwood Heaths, Cranborne Common	48	12	6	3
Bourne Valley	Bourne Valley	42	40	16	2
West Moors Plantation	Holt & West Moors Heaths, Moors River	42	13	4	3
Knighton Heath	Canford Heath, Bourne Valley	34	9	4	2
Studland Heath	Studland & Godlingston Heaths	30	11	4	2
Wareham Forest	Morden Bog & Hyde Heath	30	17	6	2
Delph Woods	-	29	18	10	2
Cannon Hill Plantation	-	27	8	3	2
Chewton Common	Highcliffe to Milford Cliffs	26	9	6	2
Lower Common	Holt & West Moors Heaths	24	13	10	2
Avon Heath	Hurn Common	20	10	10	3

[1] Note that burns can be at a variety of localities within sites.
[2] From a potential of 85 months present in the data during the 1990-1998 period.

recorded at Canford Heath (Table 3.3). However, heaths vary greatly in size. Other smaller sites than Canford Heath are likely to have had greater "densities" of fire events. For example, at Kinson Common (c. 20 ha) there had been an average of 35 fires per year (i.e. an average fire density of 1.75/ha). In comparison, at Canford Heath (c. 530 ha), the equivalent figure was 0.13 fires per hectare. Further analyses were conducted using the project GIS to investigate fire densities (see 2.3.3 and below).

The maximum numbers of fires occurring per year varied between 8-227 across these key sites (Table 3.3). The maximum exceeded 50 at seven of the 26 localities included. A staggering maximum of 97 fires per month and 12 fires per day was recorded for Canford Heath. Maxima of between 3-32 fires per month and 2-6 per day had been recorded for other sites. It is important to note that it is not necessarily the same patches of heath within particular localities that are subject to such high frequency of repeat burning. Indeed, it is unlikely that the same patch of heathland would burn twice in quick succession because there would be little or no available fuel load. However, the data were not spatially explicit enough to determine rates of re-burning within sites and there was no additional information available to assess the situation.

Fire events were mostly just a few days apart. This is illustrated in Figure 3.7, for the top three localities in Table 3.3. At Canford Heath, there was a high proportion (c.37%) of fires occurring on the same days as at least one other fire; the equivalent statistic was 22% at Kinson Common and 17% at Bourne Bottom. At all three sites fire events that were just 1-5 days apart were the most frequent.

Figure 3.7: Spacing of fire events (in days, between 1990 & 1998) for three heathland localities in Dorset with a high incidence of unplanned fires. The histograms show time intervals between fires and the number of fires occurring within each interval.

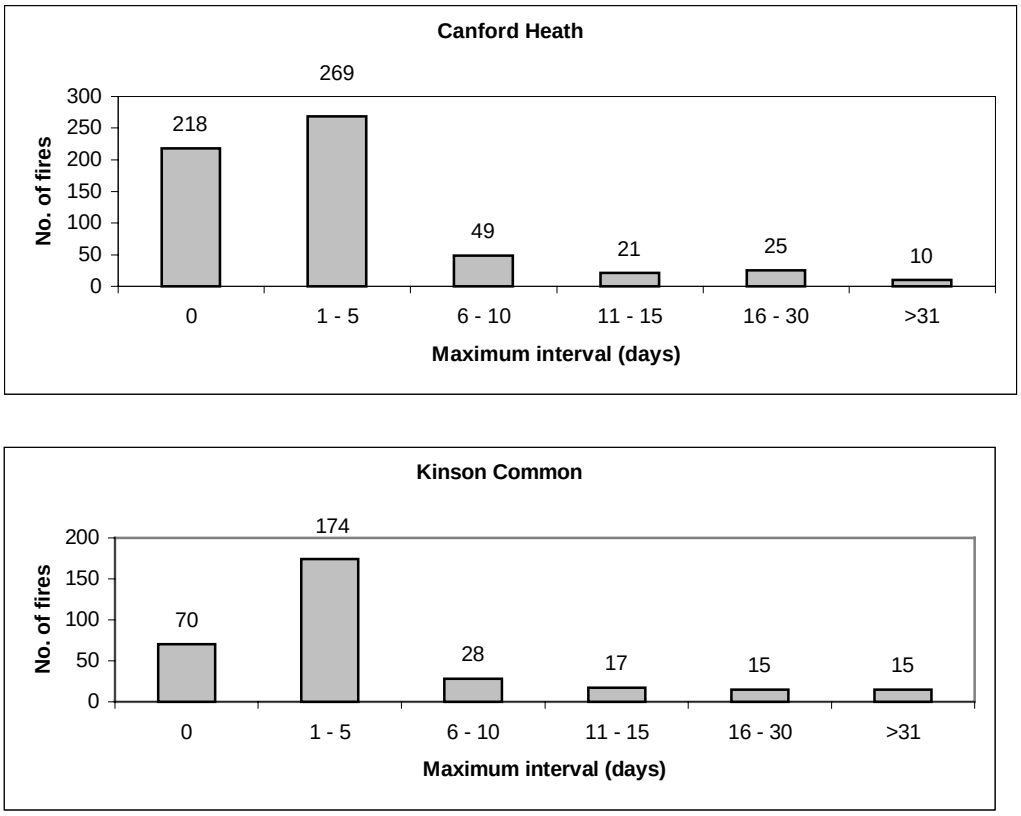
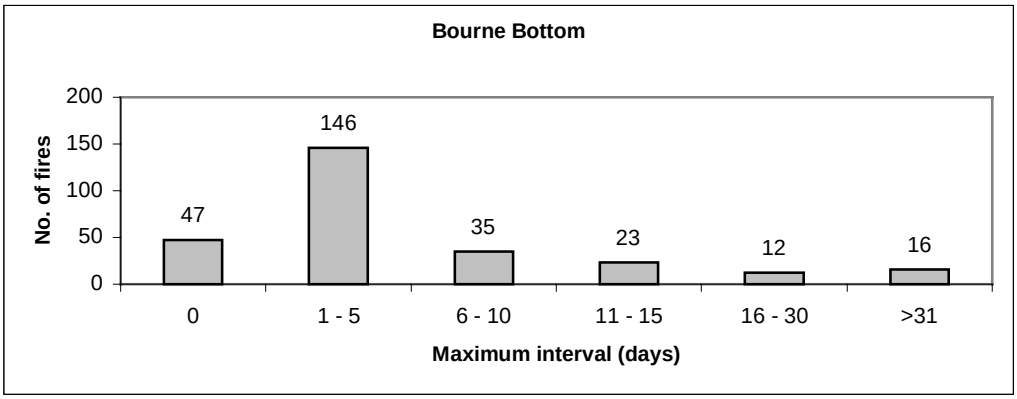


Figure 3.7 Contd.

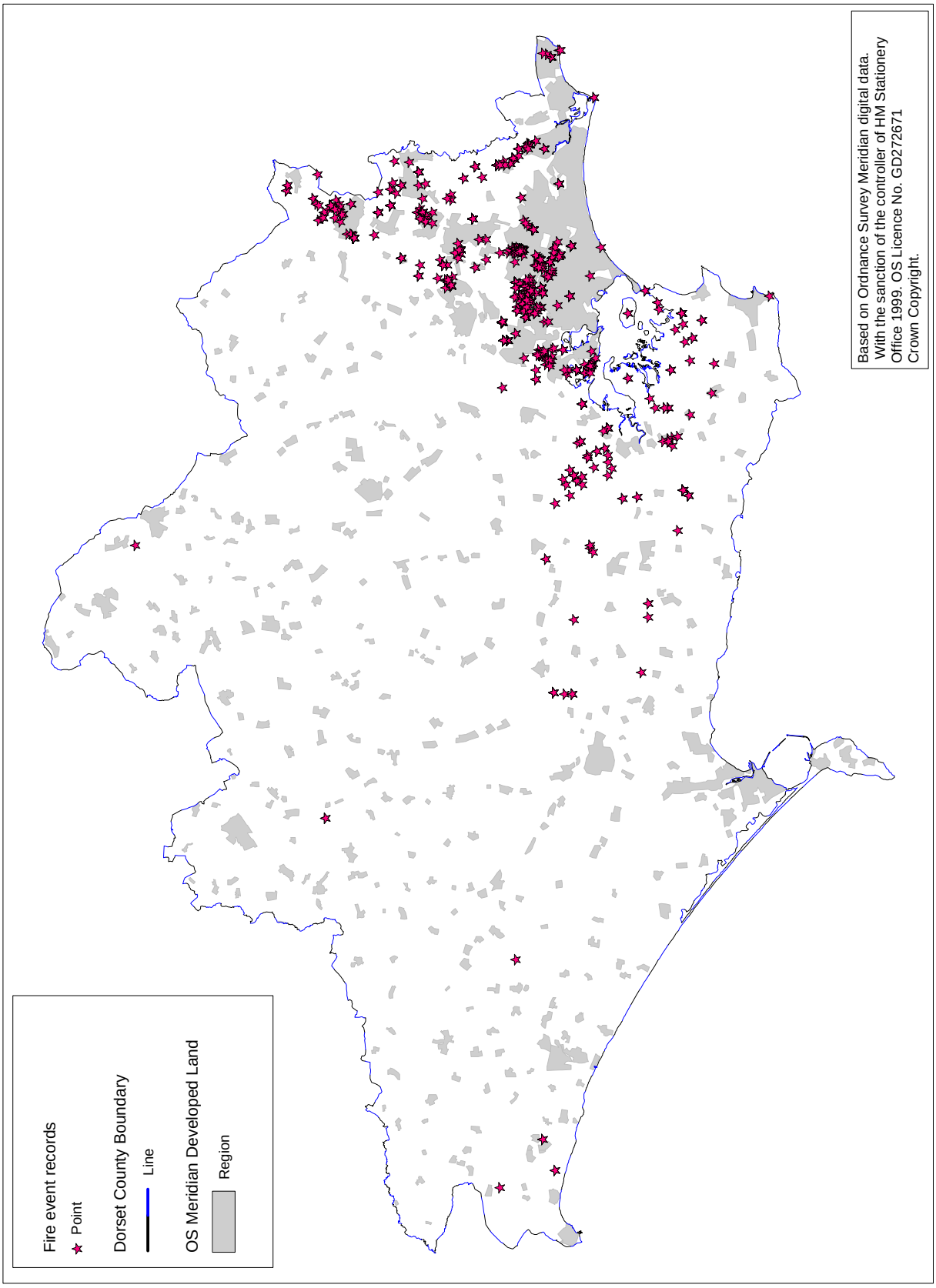


3.2.2 Geographical analyses

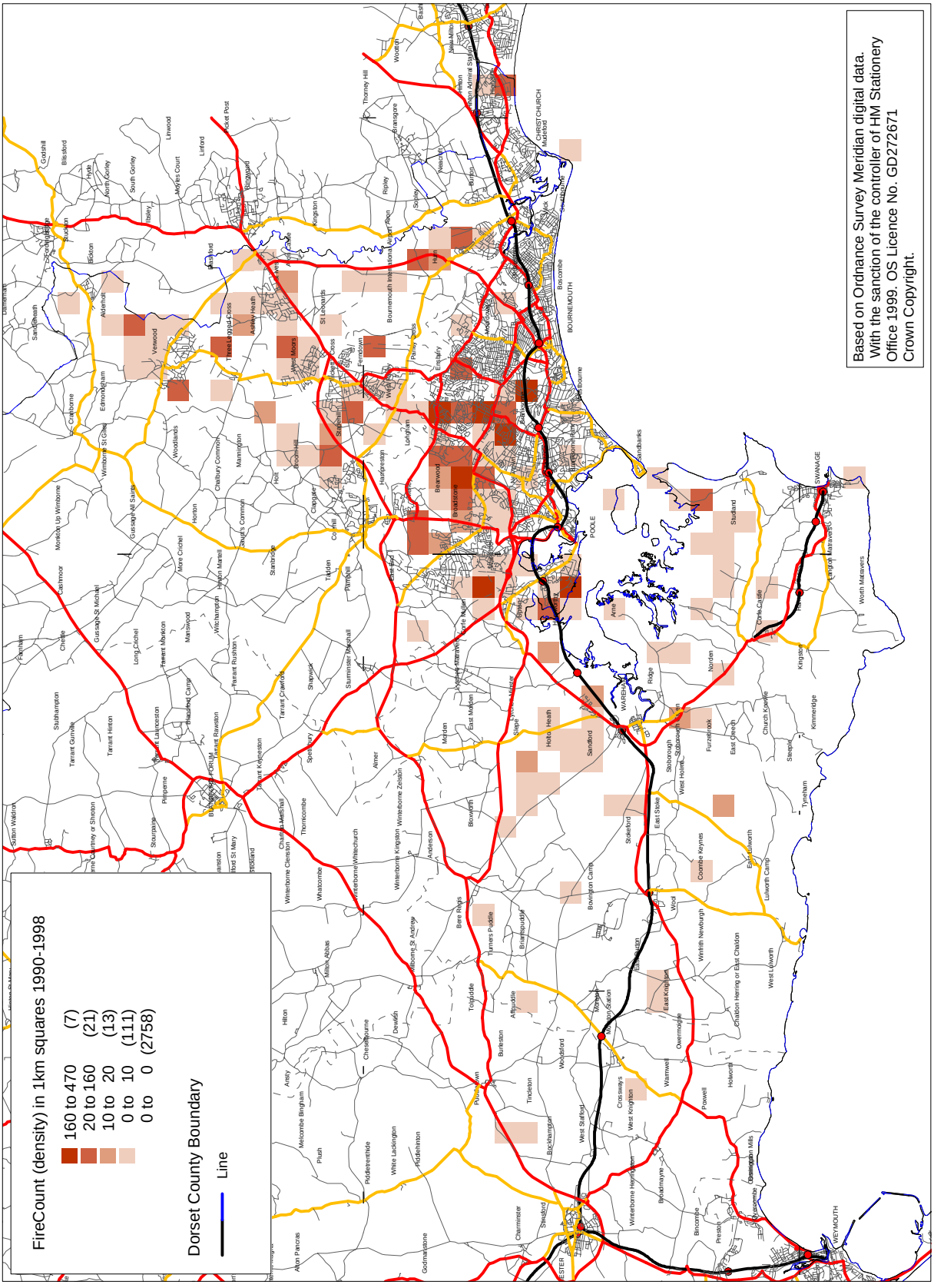
The distribution of all fire events from 1990-1998 can be seen in Map 3.1, below. The map shows the county boundary, developed areas based upon OS Developed Land Use Areas (DLUA) and the distribution of all fire events. As mentioned above, many of the points are co-incident because they were based upon site centroid grid references and therefore do not fully show fire density. However, it can be seen that most fires are in the east of the county with significant concentrations around the fringes of the Poole/Bournemouth conurbation. In fact, c.70% of the fire incidents occurred in 100-km SZ, the most south-easterly of the four 100-km squares containing parts of Dorset. Yet, this contains only 7.5% of the county and only 24.4% of heathland. Although crude, these relationships are indicative of the importance of people and urban zones to the incidence of unplanned fire events.

Because many of the grid references for fire events were co-incident further analyses were conducted on geographical density. Map 3.2 shows counts of fire events within 1km squares aligned to the National Grid and Map 3.2 shows the same with respect to SSSI boundaries. The geographical patterns shown in Map 3.1 are broadly repeated with high concentrations of fire incidence in the northern fringes of the Poole/Bournemouth conurbation. These concentrations can be visualised in other ways and a location profile model was used for Map 3.4. This represents a probability surface, on an ordinal scale, showing the concentration of fire locations throughout the study period and helps visualise the geographical foci of fire incidence. It can be seen that foci are clustered predominantly around urban fringe areas. The dominant clustering of foci is in the Canford Heath, Turbary Common and Kinson Common areas. Ham Common and Upton heath are also shown as areas of high incidence.

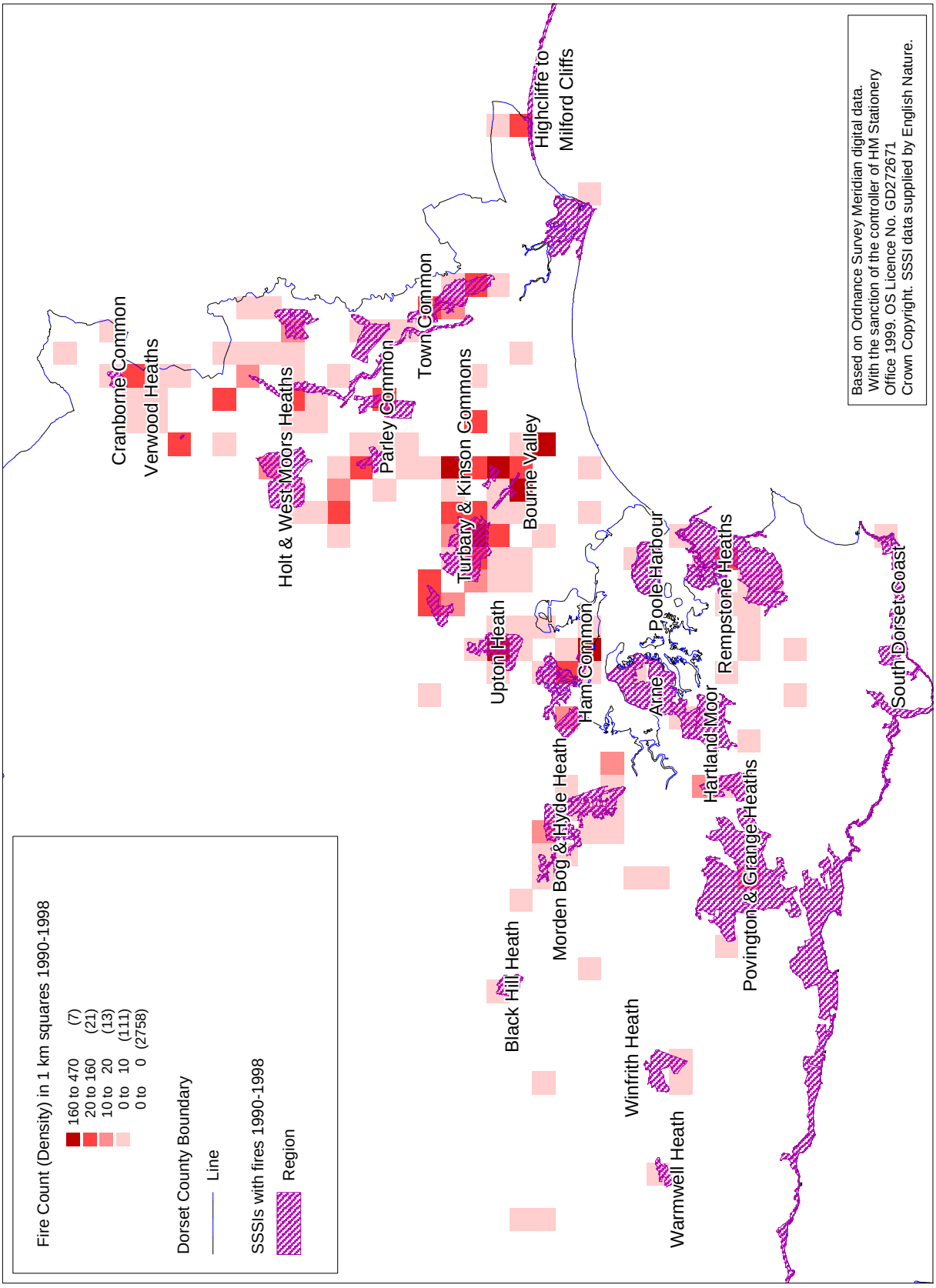
Map 3.1: **Distribution of heathland fires in Dorset 1990-1998. Grey areas are OS Developed Land Use Areas. Note many points are co-incident.**



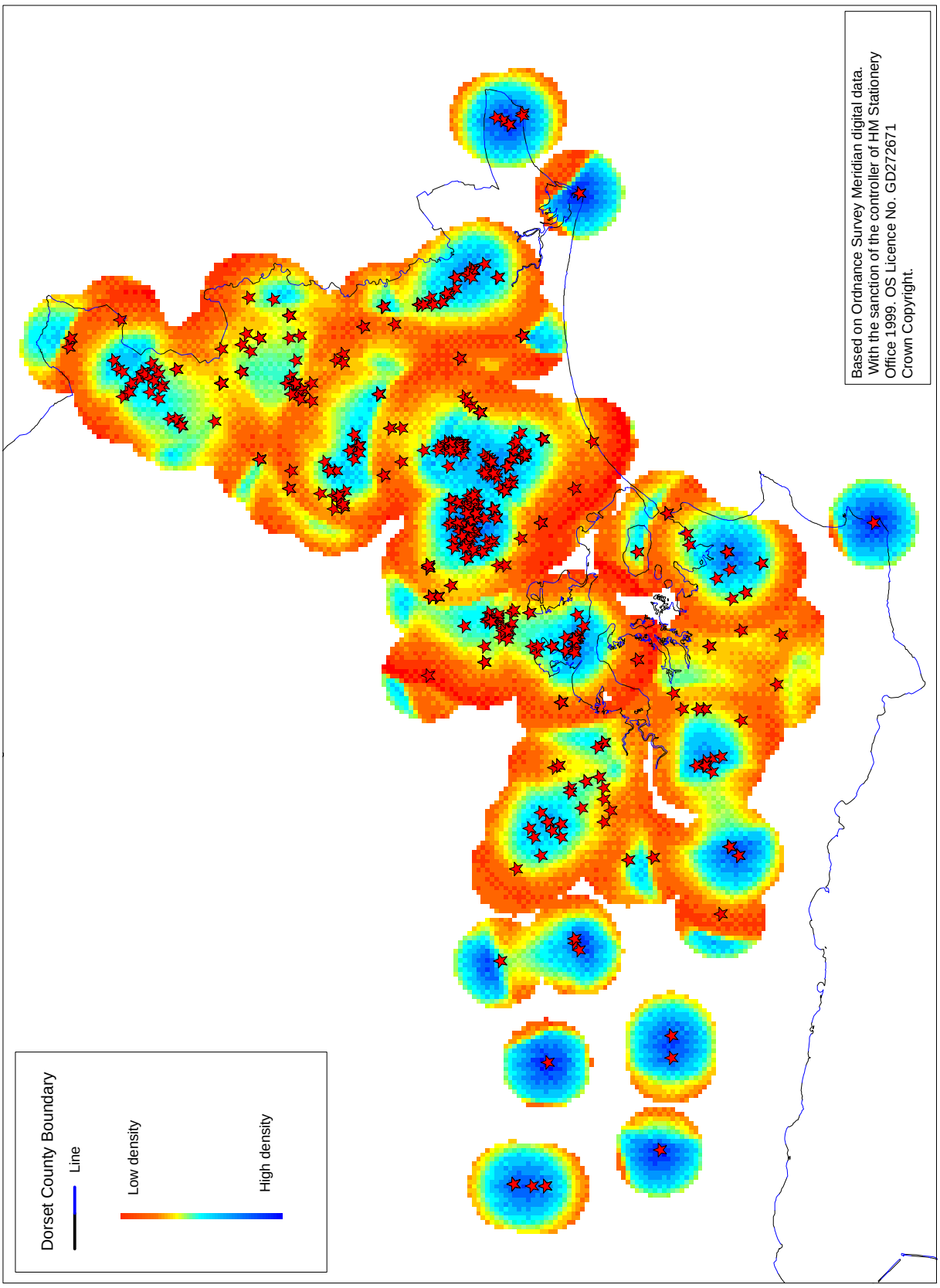
Map 3.2: **Density distribution of heathland fires in Dorset 1990-1998 in 1km squares.**



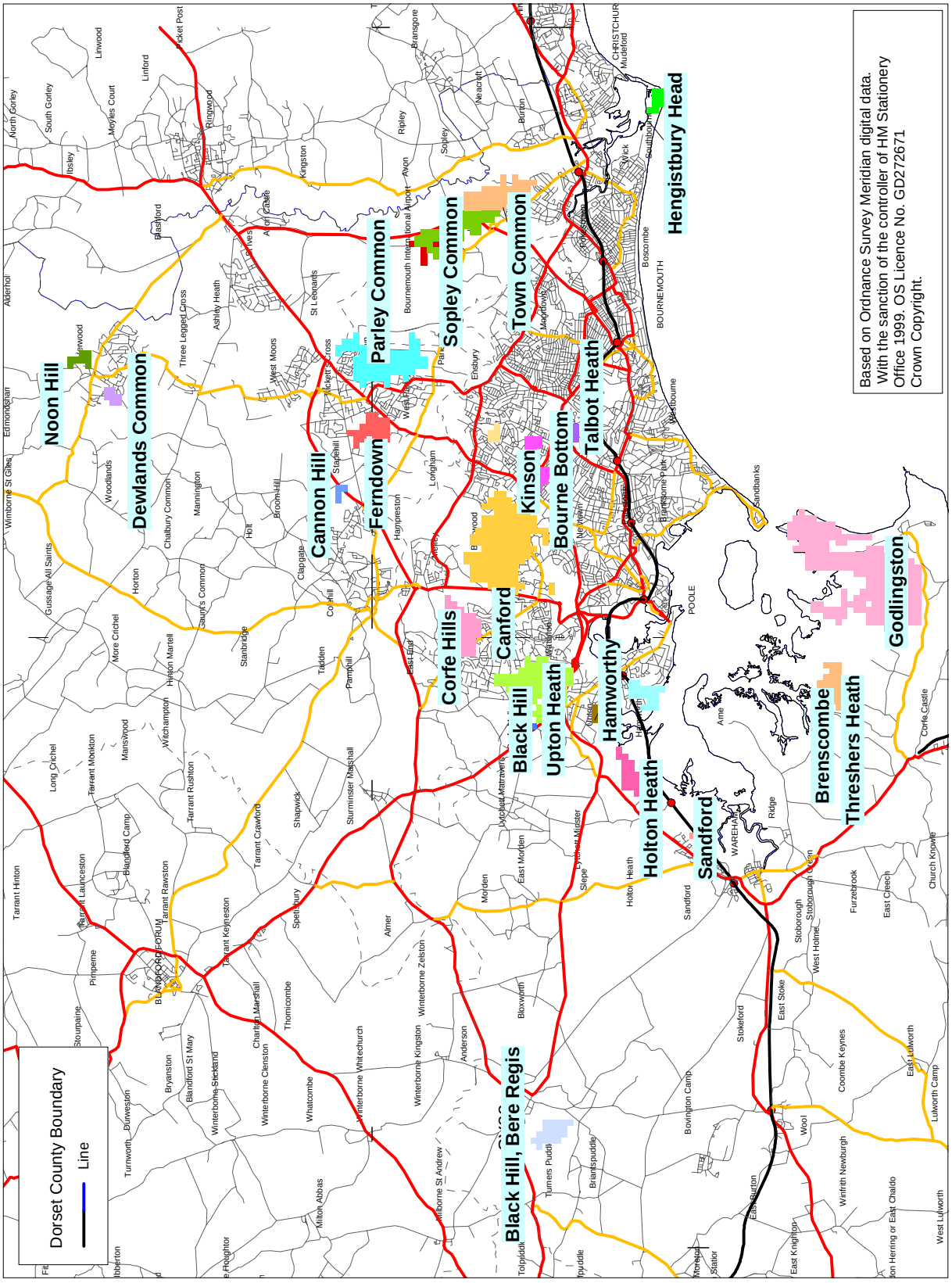
Map 3.3: **Density distribution of heathland fires in Dorset 1990-1998 in 1km squares and SSSI boundaries.**



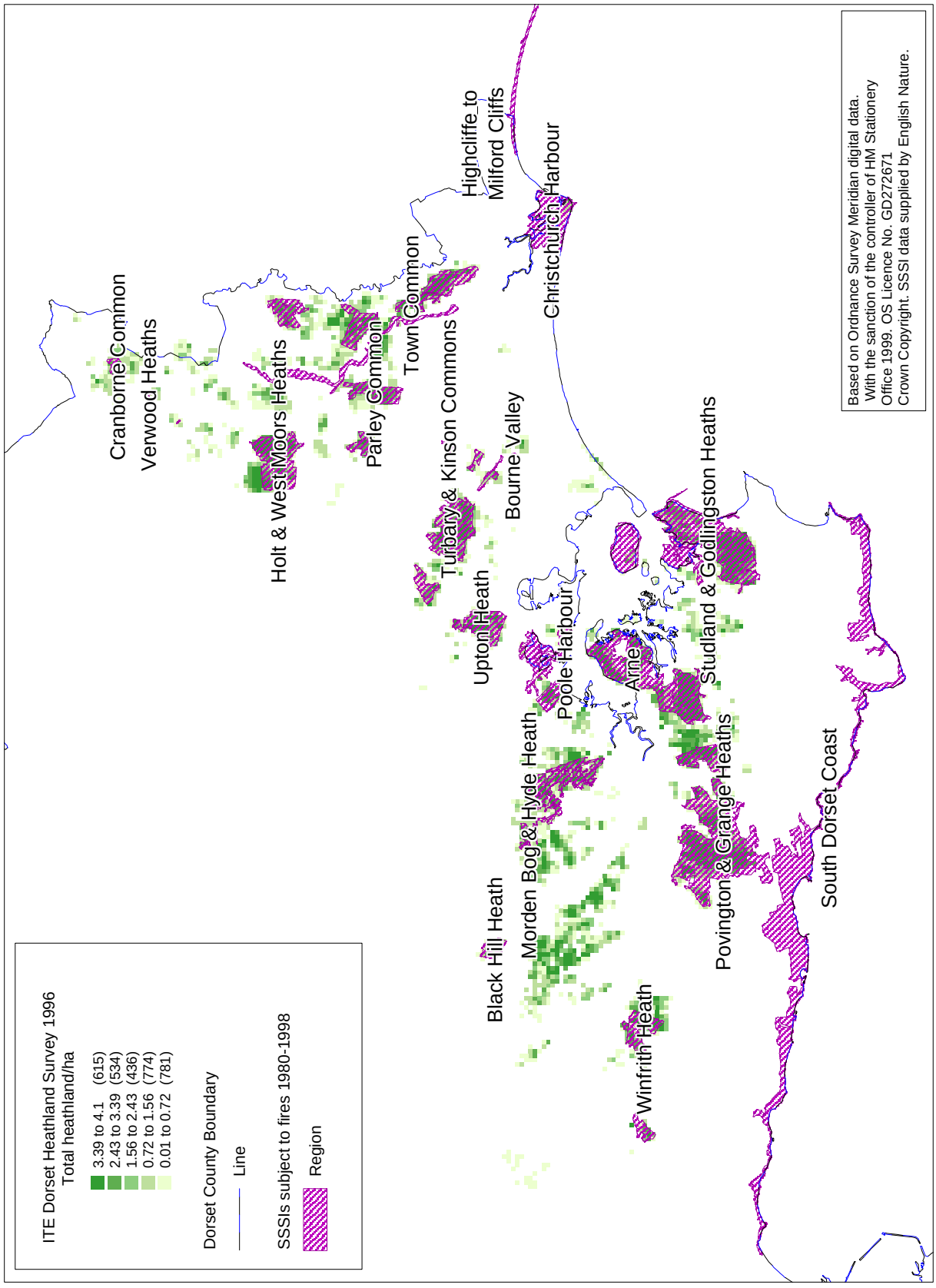
Map 3.4: **A fire location probability surface, on an ordinal scale, showing the concentration of fire locations throughout the study period. Dark blue represents high fire incidence concentrations and grades through yellow to red for lower concentrations.**



Map 3.5: **The location and extent of sites listed in Table 3.4 – the 'top twenty' most burnt sites by density of fires within heath vegetation.**



Map 3.6: **The location of fires with respect to SSSIs and heathland vegetation.**



Using spatial data sites were grouped from survey squares and counts of the number of fires within each heathland were calculated. This produced a 'League table' (Table 3.4) of most burnt sites based upon density of burning. Because the data use site names that sometimes differ from those in the fire records and those used for SSSIs (although they may refer to the same parcel of land) Table 3.4 also shows the SSSI site names for areas of land co-incident with the ITE-named survey squares.

Table 3.4: 'League table' of 20 most burnt sites from 1990-1998 based upon number of fire events per ha. Sites marked * were also recorded as key sites in statistical analysis (see Table 3.3). Some sites are repeated because the spatial data represent them as non-contiguous areas. Fire counts vary from other tables because geographic operators were used and fires were only included if they fell within sites. A dash (-) is shown where areas are not in or near a SSSI.

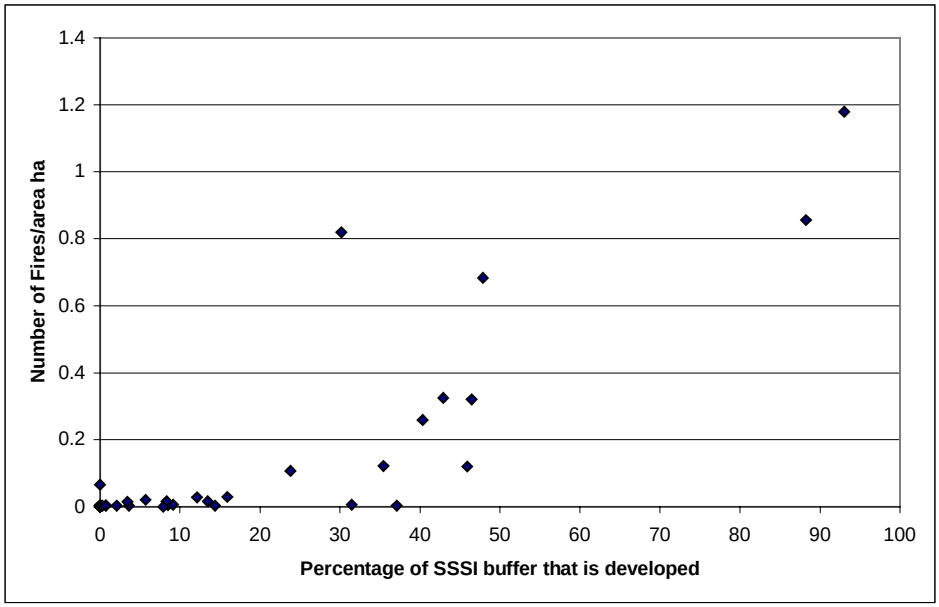
No. Fires	ITE Heath No.	ITE site name	SSSI name	Total area heath vegetation/ha	Average fire density/ha (rounded)
12	58	Sandford	Holton & Sandford Heaths	0.2	60.00
27	125	Kinson*	Turbary & Kinson Commons	1.96	13.78
48	137	Dewlands Common*	Verwood Heaths	4.85	9.90
177	75	Hamworthy	Ham Common, Poole Harbour	20.88	8.48
8	118	Talbot Heath*	Bourne Valley	2.96	2.70
108	119	Ferndown*	Ferndown Common	46.21	2.34
130	86	Corfe Hills	Corfe & Barrow Hills	56.15	2.32
649	101	Canford*	Canford Heath	286.6	2.26
180	73	Upton Heath*	Upton Heath	151.71	1.19
1	107	Cannon Hill*	-	1.01	0.99
85	138	Parley Common*	Parley Common	129.13	0.66
15	110	Bourne Bottom*	Bourne Valley, Turbary & Kinson Commons	28.14	0.53
92	155	Town Common, Sopley*	Town Common	198.85	0.46
18	64	Holton Heath	Holton & Sandford Heaths, Poole Harbour	53.89	0.33
1	124	Talbot Heath*	Bourne Valley	3.25	0.31
3	143	Noon Hill*	Verwood Heaths	11.05	0.27
2	159	Hengistbury Head	Christchurch Harbour	10.62	0.19
3	74	Threshers Heath, Brenscombe	Rempstone Heaths	33.4	0.09
2	35	Black Hill, Bere Regis	Black Hill Heath	29.84	0.07
32	88	Godlingston*	Studland and Godlingston/Rempstone Heaths	531.19	0.06

It should be noted that 'site' names vary across different data sets and do not necessarily represent the same area or patch of land. Tables 3.2 and 3.3 should be used in conjunction with each other as both use different methods for assessing incidence of burning and have their own statistical and methodological artefacts. Table 3.3 is based upon frequency within sites identified by the fire events data and Table 3.4 upon density of

burning (number of fires per hectare) in heath vegetation identified by the Dorset Heathland Survey (Rose *et al*, 1999). However, despite the different approaches there are a number of sites that are common to both analyses and these are marked in Table 3.4. It is clear that all the sites listed in both tables have been subjected to a high level of fire incidence. Map 3.5 shows the location and extent of sites listed in Table 3.4.

Map 3.1 showed the clustering of fire event points on the fringes of urbanised areas. To ascertain whether there was a statistical relationship between fire incidence and the density of surrounding built-up areas SSSI sites were investigated. The results are plotted in Figure 3.8, showing that fires were more likely to occur in sites with more densely developed areas surrounding them. Figure 3.8 also suggests that there is a threshold process operating with fires more likely to occur in sites whose have 15% or more of their surrounding area developed.

Figure 3.8: Developed area buffer analysis of heathland SSSIs (those with >20% heathland vegetation). Number of fires in site/500m buffer adjusted for area plotted against percentage of the 500m site buffer that is developed land. Correlation coefficient = 0.839.



Fire incidence in designated areas is shown in Map 3.6 and Table 3.5. The GIS analysis overlaying fire event points with SSSIs produced a list of thirty separate SSSIs that had had fires within them during the period 1990-1998, these are listed in Table 3.5. As there is no widespread use of standard site names these SSSI names differ from those used in the fire records, therefore Table 3.5 also shows the fire records names for fires co-incident with the SSSIs. If the top ten sites are considered all (with the possible exception of Verwood Heaths) are located in or adjacent to highly developed areas. The incidence of fires in SSSIs over the study period ranges from 1 to a high of 604 for Canford Heath. In addition to Canford Heath, Upton Heath, Ham Common, Corfe and Barrow Hills and Ferndown Common had in excess of 100 fires. Both Canford Heath and Upton Heath are notable because they are both large sites and have had a large number of fires.

Table 3.5: Fire incidence in SSSIs. Table is sorted by fire density (number of fires per hectare). Note site areas refer to area designated, this is not necessarily all heathland or the same area as ITE sites in Table 3.4. Additionally, fire counts vary from other tables because geographic operators were used and fires were only included if they fell within SSSIs.

Fire density	Fire Count	SSSI name	Fire Records name(s)	Area ha
5.355013	176	Ham Common	Ham Common	32.8664
2.581276	188	Bourne Valley	Bourne Bottom, Alder Hills	72.8322
1.632511	107	Ferndown Common	Ferndown Common	65.5432
1.458486	604	Canford Heath	Canford Heath, Knighton heath	414.128
1.274847	130	Corfe & Barrow Hills	Rushcombe Bottom, Corfe Hills	101.973
0.812211	179	Upton Heath	Upton Heath	220.386
0.518422	85	Parley Common	Parley Common	163.959
0.364927	13	Turbary & Kinson Commons	Turbary Common, Kinson Common	35.6236
0.277502	71	Town Common	Sopley Common, Ramsdown, St Catherines Hill, Town Common	255.854
0.074913	2	Verwood Heaths	Dewlands Common, Stephens Castle	26.6975
0.065046	18	Holton & Sandford Heaths	Holton Heath	276.729
0.044388	15	Stoborough & Creech Heaths	Stoborough Heath	337.927
0.034075	18	Hurn Common	Ashley Heath, Avon Heath, Barnsfield Heath	528.227
0.029850	4	Cranborne Common	Cranborne Common	134.004
0.028372	2	Black Hill Heath	Black Hill Heath	70.491
0.018458	2	Highcliffe to Milford Cliffs	Chewton Common	108.354
0.018140	1	Warmwell Heath	Warmwell Heath	55.127
0.014873	18	Povington & Grange Heaths	Coombe Heath, Lulworth Ranges, Povington Heath	1210.22
0.013309	4	Hartland Moor	Hartland Moor, Middlebere Heath	300.547
0.010571	7	Morden Bog & Hyde Heath	Hyde Heath, Wareham Forest	662.194
0.007100	1	Powerstock Common	Powerstock Common	140.853
0.007019	2	Winfrith Heath	Winfrith Heath	284.936
0.005801	1	Rempstone Heaths	Newton Heath	172.386
0.005726	2	Christchurch Harbour	Hengistbury Head	349.254
0.005286	4	Studland & Godlingston Heaths	Studland Heath, Godlingston Heath	756.706
0.005231	4	Holt & West Moors Heaths	Whitesheet Plantation	764.613
0.004473	1	Moors River	Week Common	223.551
0.003598	2	Arne	Arne, Slepe Heath	555.846
0.002733	6	Poole Harbour	Lytchett Bay, Brownsea Island, Studland Heath	2195.19
0.000626	1	South Dorset Coast	Durlestone Country Park	1598.58

Table 3.6: Fire incidence in SPA, SAC and Ramsar sites 1990-1997. The minor differences in numbers of fires are due to the different areas covered by each designation, but in most cases each designation relates to the same parcel of land and hence the table shows the same number of fires.

Site name	Parent site name	No. Fires SPA	No. Fires SAC	No. Fires Ramsar
Arne	Dorset Heathlands (Purbeck & Wareham)	2	1	1
Black Hill Heath	Dorset Heathlands	2	2	Not Ramsar
Bourne Valley	Dorset Heathlands	9	9	1
Canford Heath	Dorset Heathlands	604	604	17
Christchurch Harbour	Dorset Heathlands	2	2	Not Ramsar
Corfe & Barrow Hills	Dorset Heathlands	130	130	130
Cranborne Common	Dorset Heathlands	4	4	4
Ferndown Common	Dorset Heathlands	107	107	Not Ramsar
Ham Common	Dorset Heathlands	176	176	176
Hartland Moor	Dorset Heathlands (Purbeck & Wareham)	4	4	4
Holt & West Moors Heaths	Dorset Heathlands	4	1	1
Holton & Sandford Heaths	Dorset Heathlands	18	18	Not Ramsar
Hurn Common	Dorset Heathlands	3	18	Not Ramsar
Morden Bog & Hyde Heath	Dorset Heathlands	7	7	7
Parley Common	Dorset Heathlands	85	85	85
Poole Harbour	Dorset Heathlands	3	1	Not Ramsar
Povington & Grange Heaths	Dorset Heathlands	18	18	18
Rempstone Heaths	Dorset Heathlands (Purbeck & Wareham)	1	1	1
South Dorset Coast	Isle of Portland to Studland Cliffs	Not SPA	1	Not Ramsar
Stoborough & Creech Heaths	Dorset Heathlands (Purbeck & Wareham)	15	15	15
Studland & Godlingston	Dorset Heathlands (Purbeck & Wareham)	4	4	4
Town Common	Dorset Heathlands	71	71	71
Turbary & Kinson Common	Dorset Heathlands	4	13	13
Upton Heath	Dorset Heathlands	179	179	178
Verwood Heaths	Dorset Heathlands	2	2	1
Warmwell Heath	Dorset Heathlands	1	1	1
Winfrith Heath	Dorset Heathlands	2	2	2

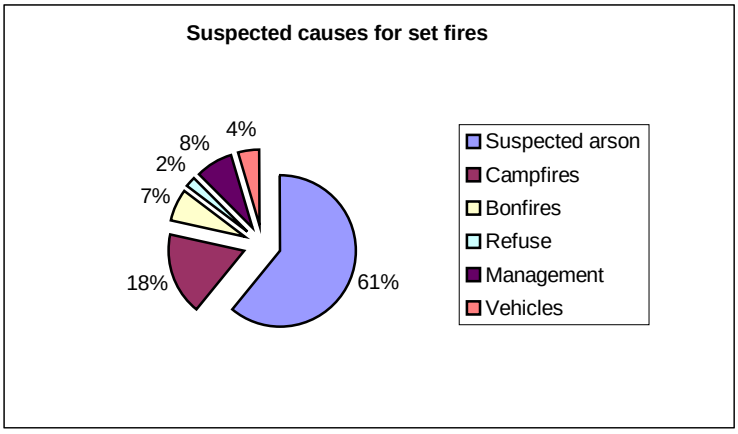
All SPA, SAC and Ramsar sites are SSSIs, therefore Table 3.6 yields very similar results to Table 3.5 for SSSIs. However, not all SSSIs are SPAs, SACs or Ramsar sites so there are slightly lower numbers of fires in some sites in Table 3.6 compared to numbers for SSSIs with the same names.

3.3 Causes and effects of fire events

There was relatively little information on the likely causes of fire events: only 217 narratives proved useful in this respect. Based on this information, most heath fires (96%) seem to have resulted from fires that had

been deliberately set, for a variety of reasons (Figure 3.9). Suspected arson accounted for the majority (58.5%), followed by campfires (17.1%) and fires set during habitat management operations (7.8%). Suspected arson was the main causative factor year-on-year (mean = 56.01%, range = 33-75%) and month-on-month (mean = 54.75%, range = 33-70%), with much variation and no overall trends in yearly or monthly patterns.

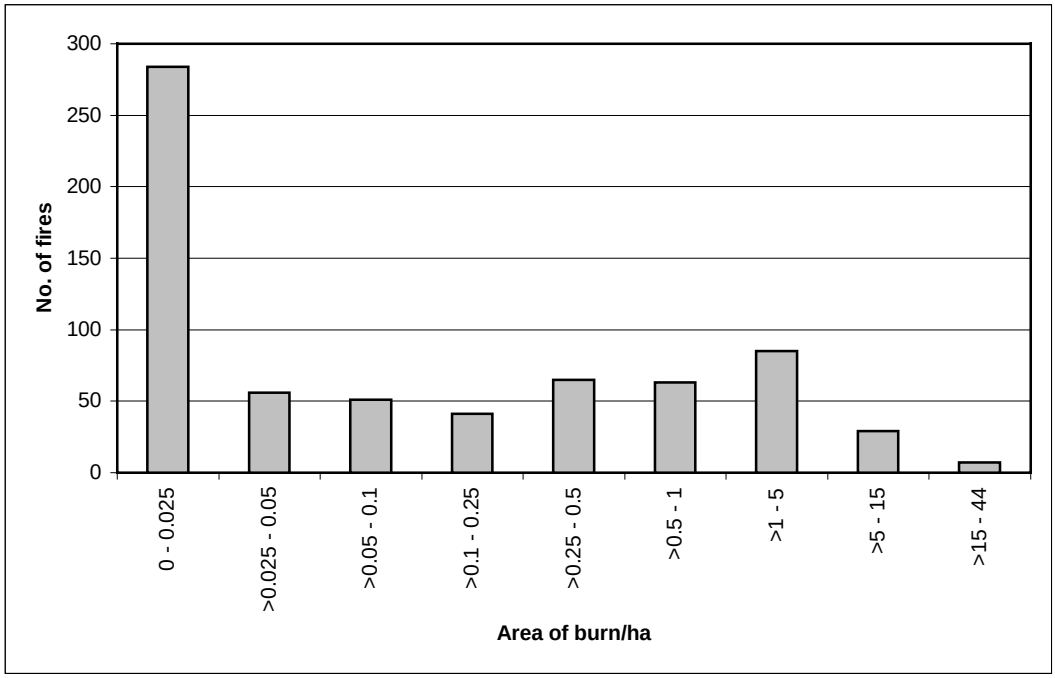
Figure 3.9: Suspected causes of unplanned fires on the Dorset Heathlands. (Indications of cause were present in 217 out of 3333 records).



There were 681 estimates for the area of the burn for heathland fires. The narratives indicated that a variety of habitat types were involved, with frequent mention of burnt grassland, gorse, scrub and woodland. However, the area estimates did not generally differentiate between the areas of each habitat types affected.

Most of the area estimates indicated that relatively small patches of heathland habitats were burnt (Figure 3.10); almost 42% of records referred to areas of less than 0.025ha and c.73% of areas of 0.5ha or less. Only seven fires were recorded at over 15ha, the largest being estimated at 44ha. However, the few large uncontrolled fires contribute over 80% of the total fire area. Looking at fires over 2ha in area there are peaks in frequency in January and July with most occurring further away from urban areas in contrast to smaller fires which occur near to urban areas.

Figure 3.10: Frequency of unplanned fires on the Dorset Heathlands in relation to estimates of their size in hectares.



4 DISCUSSION

4.1 Data quality

Few comprehensive data-sets on heathland fires were located for this study, with just three organisations supplying more than 100 records in total: DFRS, FE and PBC. Of these, DFRS provided 86.5% of the records analysed and thus the results obtained were greatly influenced by the nature and quality of the data they record. Unlike all other data sets, the DFRS records applied to any heathland in Dorset, not just to sites under the ownership or control of the organisation concerned. PBC data were most detailed for Canford Heath, except in 1995 when there was recording on other PBC sites. It should be understood that the data available contain a high degree of estimation, particularly with respect to the time of the day of a fire, the extent of burn and cause of burn. Similarly the data provide little insight into the type and intensity of individual fire events and ecological impact, unsurprising given that the records were largely collected for purposes other than ecological monitoring. For all of these reasons it is necessary to adopt a cautious approach in any interpretation of the results. These data paint the broad picture for fire incidents on the Dorset heathlands, but detailed and specific information for ecological assessment is lacking (see 4.4).

The detailed spatial analysis of the fire records was hampered by data quality. The majority of records could only be geo-referenced to a site centroid rather than a location within a site. This meant that within-site variation could not be assessed and the relationship between fire incidence and other environmental data (vegetation, topography etc) could not be investigated at any significant level of detail. Additionally, many grid references were found to be incorrect with fires apparently present in the Solent! However, the data were amenable to broad-scale analyses that revealed a number of trends.

4.2 Temporal characteristics of fire records

The number of unplanned fire events was very variable year-on-year, probably mainly a result of the weather conditions in any particular season. Previously, 1976 was a drought year with many severe uncontrolled summer fires on heaths (Maltby 1980). In Dorset, it is known that at least 660 ha of heath were burnt (RSPB/DWT) but the number of fires this represents has not been documented. A collation of information for the three years from 1988-1990 produced records for 82 fires over 0.1 ha in area, mainly in 1989 (40) and 1990 (56) (A.M. Nicholson, in Litt.). These were considered to be relatively dry summers and the incidence of fires was believed to be high. However, the present study indicates that there were 1,300 fires in 1995 and from 298-538 in the other years between 1993-1998. It seems likely that the previous collations were incomplete but, even so, 1995 was spectacularly different from other recent years. This is partly explained by the fact that PBC intensified their recording efforts for fires in that year. A further factor was likely to have been the prevailing weather conditions since it is known that 1995 was a very warm and dry year (Dorset Proceedings 1990 - 1997). 1990 was also a warm and dry year but complete fire records for that year were not available for comparison with 1995.

It is clear from this study that unplanned heath fires can occur during any month of year but are mostly during the period from April until August. In contrast to controlled burns, which are carried out in early spring and should be small, fast and of low intensity, uncontrolled fires thus tend to occur in the spring and summer, may occasionally cover a large area and may burn intensely for a long time (Bullock & Webb 1995). These

uncontrolled fires may therefore destroy all above-ground vegetation, burn into the humus (killing roots, buds and seeds) cause excessive loss of nutrients and destroy invertebrate, breeding bird and active reptile populations (see also, e.g. Hobbs & Gimingham 1987, referenced by Bullock & Webb 1995). Thus the conservation impact of unplanned spring/summer fires can be great.

During the spring and summer, April and August were the months with the highest frequency of fires, with the April peak in fires being generally the highest. This is the time when temperatures are increasing after the winter, when heathland vegetation is relatively dry and before the new growth increases the moisture content of the plants (Nigel Webb, pers. comm.). As the heather grows during the summer, its water content increases but there is a second dry period in late summer when most of the annual growth is over and when ambient temperatures are high. This could be a factor contributing to the August peak in unplanned fire incidents.

There were more fires on weekend dates than during the working week and more fires during the school holiday periods than when the schools were in session. Since the majority of fires are set fires (discussed below) this may relate to a greater use of heathland sites (either increased numbers of people or more frequent use) whilst not at work or at school. Although some of the difference may be explained by the fact that more adults may be on heathlands at the weekends, there was also a statistically significant difference in the frequencies of fire events in school and (equivalent) non-school periods.

Other factors cannot be ruled out, but the available evidence suggests that fire setting by children of school age may be a significant factor. Additionally, there is an unfortunate co-incidence that holiday periods in April and August correspond with the times when heathland vegetation is at its most vulnerable to fire and meteorological conditions are likely to be conducive to fires taking hold. Humphrey (1998) and A.M. Nicholson (in Litt.) report that it is a widespread belief amongst the general public and nature conservation professionals that most fires, if not all, are deliberate, and that children are often believed responsible.

Further evidence, though weak, comes from the within-day timing of fire incidents. Although these can and do occur at any time, day or night, most happen in the late afternoon and early evening. This is the period when children travel home from school and also 'play-out' before returning home before nightfall. There may, however, be other possible reasons of a greater incidence of fires in the late afternoon or early evening. This might also be the period of maximum use of the heath by adults, is the time of day when the heath is at its driest and is also when sea-breezes are most common (Rob Rose, pers. comm.). It is also interesting to note that the Forestry Commission has detected the same late afternoon peak in fires from their own data for the New Forest (A. Field, pers. comm.). Clearly, further research would be required to examine aspects of human behaviour and to disentangle this effect from others possibly increasing the risk of fires late in the day.

4.3 Spatial characteristics of fire records

Fires occurred on nearly all significant patches of heathland and at higher densities on the fringes of larger conurbations and within sites located within highly developed areas. Many sites such as Bourne Valley, Upton Heath, Canford Heath and Kinson Common are almost totally surrounded by developed land and in such situations, where heathland is fragmented and immediately adjoins developed land, fire presents a serious risk to ecological integrity. Moore (1962) showed that the rate of fragmentation of heathland had increased with increasing development and that the degree of isolation of many patches of heathland had increased with the likelihood of extinction for heathland species. The occurrence of fires, and more importantly repeated fires,

within heathland areas that are already fragmented or isolated are of considerable concern as their ecological and landscape integrity is therefore threatened. The 'league table' (Table 3.3) of most-burnt sites presents a site list for areas that are a potential cause for concern in Dorset.

The statistical data in combination with visual assessment and the fire event density map suggests that the incidence of fires on heaths in urbanised areas is higher than those in more rural locations. As most uncontrolled fires are set this is likely to be due to the increased number of people with rapid access to the heaths. The number of accidental fires are also likely to be higher on more heavily used heaths but the high incidence of fire must also be seen in the context of high reporting rates in populated areas. By contrast, it is possible that fires in more sparsely populated areas are under-reported.

It is clear that sites such as Canford are surrounded by developed land and suffer a high incidence of fire. It is known locally (Jez Martin, pers. comm. 1999) that Canford Heath is used as a short cut by the local population and that a large number of people both have access to the heath and make use of access to the heath. The data therefore suggest that heaths within more developed areas are potentially subject to a greater risk of fire than those in less developed areas.

The results demonstrated the high incidence of fires within SSSIs, but mainly because c.97% of Dorset Heathlands are SSSI. These are arguably the most important sites and those with formal protection. Fires occurred on sites of all sizes and at greatly varying levels. The only evident geographic pattern that is that the sites with the highest incidence of fires per hectare are those located within or near to developed areas.

4.4 Impacts on sites and species

On some sites there has been a staggering number of fires within particular years and months and even within the course of single days. In fact this was the case for 26 of the 112 localities examined here, both large and small, urban and rural. Most fires were small, with suspected arson most frequently cited as the cause of fires on the Dorset heathlands (in agreement with Farrell, 1993). Repeated burns of particular sites (examined in this study for Canford Heath, Kinson Common and Bourne Bottom) often occur either on the same day or within the same week. Thus, at least for these sites, fire events are concentrated within relatively short periods.

A weakness of the data was that we often did not know the position of the fires within the sometimes-extensive heathland sites. Even a relatively small heath may be able to accommodate large number of small burns. Because there is a lack of data on exact fire location and burn size we cannot be certain of burn frequency on an individual area. However, such a high frequency of fires is likely to damage the integrity of the heathland ecosystem. Many of the Dorset heathland sites are small and in these sites it seems possible that the same general areas of heath are being re-burnt repeatedly. Overall, for all heathlands, the frequency of burn may be less than the 15-25 year cycle recommended by conservation managers (e.g. Gimingham, 1992). However, it is important to remember that this average figure masks the fact that the frequency of burn in some locations is likely to be much higher than the normal cycle recommended for conservation management. In the light of this it is important that more comprehensive and accurate data on burn size and location are gathered in the future to fully assess the long-term impacts of high frequency burning.

Uncontrolled fires are often considered to be harmful and to create conservation problems (Farrell, 1993). However, one study of heathland vegetation responses to uncontrolled fires in Dorset concluded that there

was a negligible, or possibly beneficial, effect given the capacity of the vegetation to recover when considered at the landscape level over many years (Bullock & Webb, 1995). Thus fires helped maintain a mosaic of heathland communities, with the only one clearly detrimental effect of fires being the slight spread of bracken. At an individual site level the effects of fire may persist and the relative impact on, for example, reptile populations which may not recover so readily has not been investigated but seems likely to be of greater importance. The timing of fires is also crucially important, fires in the breeding season can remove a cohort of breeding birds. Thus, the widespread concern about the repeated burning of small fragments of heath, itself supporting internationally significant species of plants, insects, reptiles and birds, may well be justified.

Area estimations of heathland burnt have been problematic due to a lack of comprehensive and accurate data. However, it is useful to look at these figures for comparative purposes. Moore (1962) recorded that in the year preceding May 1960 about 809ha (8%) of 10,000 ha of heathland existing at that time had been burnt. Webb (1990) calculated, for the two years preceding the 1978 survey, that about 1071ha (13.6%) was burnt, mostly during the hot dry summer of 1976, when local conservation organisations estimated that about 11% of the heathland area had been burnt (DNT/RSPB, in Litt.). In contrast, the area estimated to have been burnt in the two years preceding the 1987 survey was 451 ha (6%), Webb (1990) concluded that this was indicative of a marked reduction in the proportion of the heathlands burnt.

In the present study, the majority of fires were small (<0.5ha). It is difficult to estimate the total area that has been burnt during the study period as large fires may be more reliably reported than small fires. However, using a simple arithmetical extrapolation of number of fires for the period 1993-1998 multiplied by average area and using the area of heathland estimated as present by Veitch *et al.* (1995), the proportion of heathland burnt would average 3.3%. This is in close agreement (although not including management burning) with Webb (1990). This rough figure may suggest a reduction in area burnt compared with earlier years. However, as discussed above it is important to remember there is frequent burning in many already pressured areas and management effort and responses should be invested to protect the urban and urban fringe heathland areas.

5 CONCLUSIONS

From the work conducted for this project it is possible to make a number of summary conclusions:

- Dorset's heathlands are of international conservation importance.
- Currently fire data are created and held by a variety of different organisations, with no single point of access.
- Data quality is highly variable with often inaccurate grid references, non-standard heath names, few records on area burnt, difficulties in establishing what is and what is not a 'heathland fire' and very little ecological information.
- Due to lack of data, assessment of ecological impact was very limited.
- Fires occur at all times of year with most activity between April and August, this corresponds with the time when vegetation is at its most vulnerable.
- More uncontrolled fires occur at weekends than weekdays, in school holidays than in term times and fires are more likely to occur in the afternoon and early evening.
- Fires are concentrated within more developed areas, heathlands in or adjacent to urban areas have higher numbers of fires than those in more rural locations.
- The long-term impact of the fires recorded is unclear, but some sites have large numbers of fires that are likely to cause significant ecological disturbance and damage.

6 REFERENCES

Bullock, J.M. & Webb, N.R. 1995. Responses to severe fires in heathland mosaics in southern England. *Biol. Conserv.* **73**: 207-214.

Chapman, S.B, Clarke, R.T & Webb, N.R 1989. The survey and assessment of heathland in Dorset, England for conservation. *Biol. Conserv* **47**: 137-152.

Farrell, L. 1993. *Lowland heath: extent of habitat change*. English Nature, Peterborough.

Gimingham, C.H.1992. *The lowland heath management handbook*. English Nature, Peterborough.

Harrison, C, Burgess, J, Millward, A, Dawe, G. 1995. *Accessible greenspace in towns and cities: A review of appropriate size and distance criteria.* English Nature Research Report No. 153. English Nature, Peterborough.

HMSO. 1995. *Biodiversity*. The UK Steering Group Report. Volumes 1 & 2. HMSO, London.

Hobbs, R.J. & Gimingham, C.H. 1987. Vegetation, fire and herbivore interactions in heathland. *Adv. Ecol. Res*. **16**: 87-173.

Humphrey, PC 718. 1998. *Heathland fire strategy. A report outlining the present practice in relation to heathland fire management and prevention*. Dorset Police, Dorchester.

Maltby, E. 1980. The environmental fire hazard. In: *Atlas of drought in Britain*, ed. J.C. Doornkamp, K.J. Gregory & A.S. Burn. Institute of British Geographers, London. Pp 59-60.

Moffat, A.M 1994 (ED). *Habitat conservation in England.* English Nature Research Report No.96. English Nature, Peterborough.

Moore , N.W.1962. The heaths of Dorset and their conservation. *J. Ecol*. **60**: 369-391

The proceedings of the Dorset Natural History & Archaeological Society 1990-1998

R.J. Rose , N.R. Webb, R.T. Clarke and C.H. Traynor 1999 (in press). Changes on the heathlands of Dorset, England between 1987 and 1996. *Biol. Conserv.*

RSPB/DNT 1977. *Heath fires in Dorset 1976*. A report and recommendations by the Dorset Naturalist's Trust and the Royal Society for the Protection of Birds.

Veitch, N., Webb, N.R. & Wyatt, B.K. 1995. The application of geographic information systems and remotely sensed data to the conservation of heathland fragments. *Biol. Conserv*. **72**: 91-97

Webb, N.R.1990. Changes in heathlands of Dorset, England, between 1978 and 1987. *Biol. Conserv*. **51**: 273-286.

APPENDIX 1 - METADATA QUESTIONNAIRE

I. GENERAL

1. Data source title	Name of data set
2. Description	Brief abstract of the nature of data set
3. Date of publication	Date of data 'publication'
4. Commissioning organisation	Name, address and contact
5. Implementing organisation	Name, address and contact
6. Purpose/objectives	Main purpose of data set
7. Requirement for fire event data	Why the organisation needs fire event data
8. Status	Data gathering planned, on-going or complete
9. Start date of data collection	
10. Finish date of data collection	
11. Update frequency	When or how often will data be updated – as fire events occur?

II. SURVEY

12. Geographical coverage	Spatial extent of the data set - whole county, etc.
13. Habitat coverage	Definition for different habitats included. Different types of heath?
14. Is lowland heathland included?	If so, what definition is used?
15. Details of all variables recorded	Full description of how the data are recorded in the field and coded in the data set. Are classifications or groupings employed? Classes used and any assumptions/conventions followed.
16. Variables for location, time, extent, cause, and severity of fire damage	Specific details for variables that are especially important to this study
- **fire location/site**	If fire records refer to a site does this mean the entire site or a portion?
- **National Grid Ref (centroid, point)**	How the locations of points or areas are recorded
- timing	Recording of dates, and start and end times for fires
- **weather conditions**	What weather variables are recorded
- **boundary i.e. extent**	How the boundaries of areas are recorded How and what the units of measurement are.
- **fire maps**	Available or not. What scale?
- **cause or causes**	Type and strength of evidence available
- **fire type/intensity**	Are different types of fire distinguished?
- **nature/severity of ecological damage**	What information on ecological damage is recorded?

III. ACCESS DETAILS

17. Name of data holder(s)	Name and address of organisation holding/supplying data
18. Contact person	Name of contact person
19. Postal address	
20. Email address	
21. Internet address	URL for organisation URL for data
22. Access terms	Terms by which data are made available:
23. Copyright	Data subject to copyright?
24. Constraints on use?	
25. Data format	Give approximate proportions for each and indicate where the same data are held in more than one format: Tabular Report Maps Record Cards.
26. Are data available digitally:	No ☐ Yes ☐ Please answer i-iv
i Platform on which held	PC ☐ MAC ☐ UNIX ☐ - type..... Other ☐
ii Digital file formats available	
iii Indicative size of data set (MB)	
iv Supply media	
27. Accuracy/quality assurance measures used	Standard or special methods employed e.g.: Completeness - omission and/or commission Thematic accuracy - e.g. standard classifications Temporal accuracy - e.g. time recordings Positional accuracy - absolute (NGR) and/or relative (other features) Logical consistency - topology and/or attribute relationships (positioning of GIS layers)
28. Data security procedures	Describe measures for both digital and paper records
29. Supporting documentation:	Please indicate what documentation is available and give title/reference:

User manual ☐ _____

Data definitions ☐ _____

Data lineage/version ☐ _____

Other - please specify ☐ _____

IV. FUTURE OPTIONS

30. Do the data you gather meet your information needs?	
31. If not what other variables/information would you find useful?	
32. How are the data shared within and between organisations?	
33. What are the plans for on-going data collection?	
34. Any other information	

V. AVAILABILITY FOR THIS PROJECT

35. Are these data available for this project?	
36. If so, what is the best way of making these data available?	
37. Will there be conditions attached to data release?	

END - Thank you for your help in this project

APPENDIX 2 – COMPLETED METADATA QUESTIONNAIRES

Date: 7.12.98 Interviewee: Alun Morgan & Andy Motteram Organisation: **Dorset Fire and Rescue Service**	
Data source title	Part of standard Control Centre records
Description	Fire event records for all fires reported to the Control Centre and attended by the Fire Service in Dorset.
Date of publication	Data not published
Commissioning organisation	Dorset Fire and Rescue Service, Colliton Park, Dorchester, Dorset, DT1 1FB. Contact: Alun Morgan
Implementing organisation	N/a
Purpose/objectives	To provide full fire incident information necessary for statutory reporting to the Home Office. Also to facilitate budget and resource decision-making and assisting in community fire safety.
Requirement for fire event data	As above.
Status	Data gathering on-going
Start date of data collection	1948
Finish date of data collection	On-going
Update frequency	Records made as fire events occur, with immediate updating.
Geographical coverage	Dorset
Habitat coverage	All habitat types. Do not distinguish between different types of heath.
Is lowland heathland included?	Yes. No strict habitat definition.
Details of all variables recorded	Many variables are recorded. Information is radioed through to the Command and Control Centre and entered on-screen into the Control Centre system. A key feature is that standard Home Office codes are used to classify small fires, with heaths lumped in the category “grass/heath/railway embankment/verges/single trees”. Full details of the variables can be provided with the data.
Specific variables – fire location	This can be the address of the house first attended, a second address that provided better access or the name of the heath or part of it.
National Grid Ref (centroid, point)	Six figure grid references are recorded for the centre points of all “localities” – as described above. From 1.5.98 a special effort has been made for heaths. In this case, six figure grid references for the centre of the heath (not the burn) are recorded in addition to grid references for localities).
- timing	Record date of the call. Record time of call (which is normally close to the start of the fire) and time of end.
Weather conditions	Not recorded.
Boundary i.e. extent	No boundary recorded. Approximate area of burn estimated in square metres.
Fire maps	None.
cause or causes	Recorded as accidental or malicious.
fire type/intensity	Not recorded, though perhaps can be estimated on the basis of duration and manpower deployed.
nature/severity of ecological damage	Not recorded.
Name of data holder(s)	Dorset Fire and Rescue Service
Contact person	Andy Motteram (Control Centre Manager)
Postal address	Dorset Fire and Rescue Service, Colliton Park, Dorchester, Dorset, DT1 1FB. Contact: Alun Morgan
Email address	None

Internet address	None
Access terms	Data not normally supplied.
Copyright	Not sure.
Constraints on use?	Must meet requirements of the Data Protection Act.
Data format	100% in tabular form.
Are data available digitally:	Yes
I Platform on which held	PC
ii Digital file formats available	SyBase and MS Access (relational databases)
iii Indicative size of data set (MB)	Full data set is c.3Gb
iv Supply media	Disc, CD or Tapes
Accuracy/quality assurance measures used	No rigorous QA methods employed. Information radioed from the fire incident is recorded (taped) and kept for 3 months (or longer if required for legal actions).
Data security procedures	All external discs are virus checked. Full password protection. Backups are made weekly to tape and kept at different localities on site. Paper records and audiotapes not duplicated and kept locally.
Supporting documentation:	Full procedural notes are available for the Control Centre system. A full data directory is available, containing data definitions. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes
If not what other variables/information would you find useful?	N/a
How are the data shared within and between organisations?	Routine reporting to Area Commanders and Community Fire Safety Officers. Monthly summary reports are provided to external organisations on request.
What are the plans for on-going data collection?	Plan to continue as now, with improvements to assist with providing data to others.
Any other information	Fires that are suspicious are always reported to the police. They chose whether to respond or not. This MS Access-based system is incompatible with the Lotus Notes system used elsewhere through the fire service, thus paper records are provided. The system has changed three times, with better access and improved data each time. From 1991, system 1; from 1993, the SyBase/MS Access system was introduced; from 1995, live system introduced with better record keeping.
Are these data available for this project?	Yes.
If so, what is the best way of making these data available?	There are at least 10000 records for the category of fires that includes heaths. These will need to be filtered and this is best done by DFRS, since they have local knowledge and detailed knowledge of the system. Will advise regarding resource implications and timing of this work. After supply, will need comprehensive checking of grid references and heath site names.
Will there be conditions attached to data release?	To be advised.

Date: 7.12.98 Interviewee: Robert Brunt Organisation: **Dorset Wildlife Trust**	
Data source title	Activity reports for reporting events on reserves
Description	Records of fire incidents of DWT reserves
Date of publication	Data not published
Commissioning organisation	Dorset Wildlife Trust, Brooklands Farm, Forston, Dorchester, Dorset, DT2 7AA. Contact: Robert Brunt
Implementing organisation	N/a
Purpose/objectives	Monitoring of the frequency and patterns of fire events for DWT habitat management purposes
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	1991
Finish date of data collection	On-going
Update frequency	Records made as fire events occur. Updated centrally every year.
Geographical coverage	DWT heathland reserves: all 10 in Dorset.
Habitat coverage	All habitats on reserves are included. Do not routinely distinguish between different types of heath but can be done retrospectively.
Is lowland heathland included?	Yes. Definition per Phase 1 habitat survey
Details of all variables recorded	DWT use a standard data recording form, stored as paper records. However one reserve may has recently started to collect data in a format akin to that required by English Nature. The standard recording form variables are site code, site name, event code, event number, recording date, compartment, localities, short description, month, recorder, narrative and resource (staff/expenditure) details. No classifications or groupings are employed.
Specific variables – fire location	Standard names for heaths and compartments and localities within them are used
National Grid Ref	Not recorded
- timing	Date of fire not always recorded. Start and end times rarely recorded.
weather conditions	Not recorded.
boundary i.e. extent	Approximate area burnt marked on a map (various scales). No measurements taken.
fire maps	Approximate area burnt marked on a map
cause or causes	Recorded descriptively, if known
fire type/intensity	No information recorded
nature/severity of ecological damage	Not systematically recorded. May be some descriptive notes.
Name of data holder(s)	Dorset Wildlife Trust
Contact person	Robert Brunt
Postal address	Dorset Wildlife Trust, Brooklands Farm, Forston, Dorchester, Dorset, DT2 7AA.
Email address	dorsetwt@cix.compulink.co.uk
Internet address	None
Access terms	No standard terms.
Copyright	None
Constraints on use?	None
Data format	100% record cards. Most records accompanied by a map

Are data available digitally:	No
I Platform on which held	N/a
ii Digital file formats available	N/a
iii Indicative size of data set (MB)	N/a
iv Supply media	N/a
Accuracy/quality assurance measures used	No QA methods employed
Data security procedures	No duplicates of paper records
Supporting documentation:	Use EN recording guidelines for reserve activity records. No standard data definitions used. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes
If not what other variables/information would you find useful?	Interested in better and more standardised measures, for example on fire types and nature of ecological damage.
How are the data shared within and between organisations?	Not routinely shared. May be provided in response to specific requests.
What are the plans for on-going data collection?	Plan to continue as now.
Any other information	This is not a big issue for DWT, with only c.21 records so far! DWT reserves generally in rural locations and fires are a rare event. Willing to participate in future recording initiatives.
Are these data available for this project?	Yes.
If so, what is the best way of making these data available?	Records will be photocopied and provided.
Will there be conditions attached to data release?	DWT would require acknowledgement and copies of the project reports.

Date: 7.12.98 Interviewee: Neil Gartshore Organisation: **Royal Society for the Protection of Birds**	
Data source title	Activity reports for annual reporting
Description	Activity reports include narratives on fire incidents of RSPB land (four heathland reserves in Purbeck)
Date of publication	Data not published
Commissioning organisation	Royal Society for the Protection of Birds, Syldata, Arne, Wareham, Dorset, BH20 5BJ. Contact: Neil Gartshore (Warden)
Implementing organisation	N/a
Purpose/objectives	To provide a brief description of fire events that might be relevant to future habitat management decisions
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	Annual reporting commenced in 1966
Finish date of data collection	On-going
Update frequency	Field notes made as fire events occur. CMS-based records updated every few weeks.
Geographical coverage	RSPB heathland reserves in Purbeck: Arne, Stodborough, Wareham Meadows and Grange Heath.
Habitat coverage	All habitats on reserves are included. Narrative may distinguish between different types of heath
Is lowland heathland included?	Yes. Definition per Phase 1 habitat survey
Details of all variables recorded	Wardens make field notes, recording what they feel is important. No data recording form, therefore data collection varies between individuals. Narrative entered as an activity record in Countryside Management System software. Variables are date, approximate time, location, compartment, six figure grid reference, extent of fire, any known cause and any other information. No classifications or groupings are employed.
Specific variables – fire location	Standard names for heaths and compartments within them are used
National Grid Ref (centroid, point)	Six figure grid references centred on the burnt area
- timing	Record date that fire started, time when fire reported and approximate end time
weather conditions	May be recorded in the narrative if thought to be particularly important
boundary i.e. extent	Approximate area burnt generally marked on a map (various scales) Area of burn estimated in hectares
fire maps	Approximate area burnt generally marked on a map
cause or causes	Recorded descriptively, if known
fire type/intensity	No information recorded
nature/severity of ecological damage	Not systematically recorded. May be some descriptive notes.
Name of data holder(s)	Royal Society for the Protection of Birds
Contact person	Neil Gartshore (Warden)
Postal address	Syldata, Arne, Wareham. Dorset, BH20 5BJ.
Email address	None
Internet address	None
Access terms	RSPB standard terms for data supply may apply

Copyright	Data under RSPB ownership
Constraints on use?	None
Data format	100% in annual reports. Most records accompanied by a map
Are data available digitally:	Yes
I Platform on which held	PC
ii Digital file formats available	CMS records, exportable as .RTF or .XLS
iii Indicative size of data set (MB)	Not known
iv Supply media	Disc
Accuracy/quality assurance measures used	No QA methods employed
Data security procedures	All external discs are virus checked. Backups are made regularly and kept off site. Paper records (annual reports) available in duplicate in different places.
Supporting documentation:	CMS user manual No standard data definitions used. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes
If not what other variables/information would you find useful?	N/a
How are the data shared within and between organisations?	Annual reports supplied to RSPB's Regional Office. Not routinely shared outside of RSPB but may be provided in response to specific requests.
What are the plans for on-going data collection?	Plan to continue as now.
Any other information	Willing to comment on approaches developed for this project, and to participate in future recording initiatives.
Are these data available for this project?	Yes.
If so, what is the best way of making these data available?	Best to use the information supplied to English Nature. This is up-to-date and is the best interpretation of the data available. Nothing more is available from the CMS records.
Will there be conditions attached to data release?	RSPB would require acknowledgement, copies of the project reports and would welcome the opportunity to comment on the project outputs.

Date: 8.12.98 Interviewee: Sandy Dolbear Organisation: **The Herpetological Conservation Trust**	
Data source title	Reports for event-recording on reserves
Description	Records of fire incidents on HCT reserves
Date of publication	Data not published
Commissioning organisation	The Herpetological Conservation Trust, 655A Christchurch Road, Boscombe, Bournemouth, Dorset, BH1 4AP. Contact: Sandy Dolbear
Implementing organisation	N/a
Purpose/objectives	To determine long-term effects on heathland extent, condition and, principally, its herpetological populations. To understand the resultant changes in heathland ecology.
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	1989
Finish date of data collection	On-going
Update frequency	Records made as fire events occur and updated centrally on a continuous basis.
Geographical coverage	HCT heathland reserves in Dorset: 42 sites owned, licensed or leased, and 32 sites with management agreements (e.g. MoD, DCC, FC, private etc. lands).
Habitat coverage	All habitats on reserves are included. Do not routinely distinguish between different types of heath but can be done from habitat maps available for reserves.
Is lowland heathland included?	Yes. Use own habitat definitions for mapping for management purposes.
Details of all variables recorded	HCT compile narratives for each fire event often from more than one person with each recording what they feel is important. They do not use a standard data recording form. A representative series of photographs are taken and kept. The narratives are stored as paper records.
Specific variables – fire location	Standard names for heaths and compartments (where there are management plans) are used
National Grid Ref	Six figure recorded for centre point of fire.
- timing	Date of start of fire recorded. Rely on fire service records for start and end times.
weather conditions	General description included in the narrative.
boundary i.e. extent	Approximate area burnt marked on a map (reserve maps). Approximate area estimated (in hectares or square metres).
fire maps	Approximate area burnt marked on a reserve map
cause or causes	Recorded descriptively, if known
fire type/intensity	No information recorded
nature/severity of ecological damage	General descriptive of damage to habitats and animals is made. Often followed by expert assessments for reptile populations. By reference to detailed monitoring information for reptiles (on HCT and other properties) a good assessment of the severity of damage to reptiles can be made.
Name of data holder(s)	The Herpetological Conservation Trust
Contact person	Sandy Dolbear
Postal address	The Herpetological Conservation Trust, 655A Christchurch Road, Boscombe, Bournemouth, Dorset, BH1 4AP.
Email address	herpconstrust@hcontrst.force9.net
Internet address	None
Access terms	No standard terms.

Copyright	Data owned by HCT.
Constraints on use?	None
Data format	100% descriptive reports, with a map and photographs.
Are data available digitally:	No
I Platform on which held	N/a
ii Digital file formats available	N/a
iii Indicative size of data set (MB)	N/a
iv Supply media	N/a
Accuracy/quality assurance measures used	No QA methods employed
Data security procedures	No duplicates of paper records. Paper records not secure. Virus checking is routine (Dr Solomon's, with quarterly updates)
Supporting documentation:	No supporting documentation. No standard data definitions used. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes
If not what other variables/information would you find useful?	N/a
How are the data shared within and between organisations?	Not routinely shared. May be provided in response to specific requests.
What are the plans for on-going data collection?	Plan to continue but to streamline and develop database records. Map-based package (customised application) being developed for reserve records.
Any other information	This issue is extremely important to HCT. Many of the reserves they manage are urban and repeatedly suffer fire damage, both accidental and intentional. HCT would like to see some prosecutions so that arsonists will be discouraged. Need more wardens on the ground, good education and, eventually, community-based proactive solutions. Need on site facilities for fire fighting and perhaps buffer zones between housing and heaths. The Fire Service now pages HCT as fires occur. They routinely participate as active fire fighters but cannot attend all fires. Reptiles are moved, where possible, from burnt to unburnt areas. HCT maintain fire breaks in areas of high risk and intensify wardening activities during holiday periods.
Are these data available for this project?	Yes.
If so, what is the best way of making these data available?	Records will be photocopied and provided. Only c.5 records in total.
Will there be conditions attached to data release?	HCT would like the reptile records to remain confidential, would require acknowledgement and copies of the project reports.

Date: 8.12.98 Interviewee: Jez Martin Organisation: **Borough of Poole**	
Data source title	Fire records from Patrol Reports
Description	Records of fire incidents for Patrol Reports on BoP land, especially Canford Heath
Date of publication	Data not published
Commissioning organisation	Borough of Poole, Northmead House, 30-32 Northmead Drive, Creekmoor, Poole, Dorset, BH17 7RP. Contact: Jez Martin (Countryside Warden, Canford Heath).
Implementing organisation	N/a
Purpose/objectives	To determine the frequency, pattern, extent and damage from fire events. This to influence management and resource decisions.
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	1991 (but detailed from 1995)
Finish date of data collection	On-going
Update frequency	Records made as fire events occur. Files updated immediately.
Geographical coverage	The five BoP heathland sites in Dorset.
Habitat coverage	All habitats on sites are included. Have started, very recently, to distinguish between different types of heath.
Is lowland heathland included?	Yes. No strict definition employed.
Details of all variables recorded	For Canford Heath produce a detailed narrative in the form of a Patrol Report (as a Word document). For other sites, only very brief reports are made. For Canford Heath, all reports are made by JM and information immediately transferred to a detailed spreadsheet format. The variables recorded are N/A. No standard data recording form is used. Classifications or groupings are employed.
Specific variables – fire location	"Canford Heath", plus compartment codes are used
National Grid Ref	Six figure grid references have been recorded from 1998. For small fires, just a central point is recorded. For a large fire, grid references for centre and up to five edge points are recorded.
- timing	Date, approximate start time and duration are recorded.
weather conditions	Recorded only when obviously important to the incident.
boundary i.e. extent	Boundaries not routinely recorded. Areas estimated (square metres).
fire maps	Approximate area burnt marked on a map for large fires only.
cause or causes	Recorded descriptively, if known
fire type/intensity	Distinguish between "surface burn" (quick) and "deep burn" (slow)
nature/severity of ecological damage	Make descriptive notes for habitats and counts of dead or injured animals.
Name of data holder(s)	Borough of Poole
Contact person	Jez Martin (Countryside Warden, Canford Heath).
Postal address	Borough of Poole, Northmead House, 30-32 Northmead Drive, Creekmoor, Poole, Dorset, BH17 7RP.
Email address	j.martin@poole.gov.uk
Internet address	www.poole.gov.uk
Access terms	No standard terms.
Copyright	BoP ownership

Constraints on use?	Need to respect confidentiality and adhere to Data Protection Act regulations.
Data format	100% tabular, most records accompanied by a map
Are data available digitally:	Yes
I Platform on which held	PC
ii Digital file formats available	MS Word 6/95; MS Excel/95
iii Indicative size of data set (MB)	<1 Mb
iv Supply media	Disc, CD-ROM, Tape
Accuracy/quality assurance measures used	No rigorous QA methods employed. Some self checking.
Data security procedures	Routine virus checking. Weekly backup to tapes, stored off site. No duplicates of paper records; these stored locally.
Supporting documentation:	No supporting documentation. No standard data definitions used. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes for Canford Heath. Would like same data for other sites.
If not what other variables/information would you find useful?	Interested in the influence of weather conditions and in developing a predictive approach.
How are the data shared within and between organisations?	Used to brief volunteer heath wardens. May be provided in response to specific requests.
What are the plans for on-going data collection?	Plan to continue as now but investigating CMS or GIS-based recording for the future.
Any other information	Useful to know when children are released from school in relation to daylight. Children not thought to be the main factor on Canford Heath.
Are these data available for this project?	Yes.
If so, what is the best way of making these data available?	Copies of spreadsheets provided on disc. Patrol reports (Word files) not worth accessing.
Will there be conditions attached to data release?	BoP would like to ensure confidential information is kept as such (e.g. names), would require acknowledgement, copies of the project reports and the opportunity to comment on reports, if possible.

Date: 9.12.98 Interviewee: Peter Thompson Organisation: **East Dorset District Council**	
Data source title	General reserve records
Description	Records of fire incidents on EDDC properties
Date of publication	Data not published
Commissioning organisation	East Dorset District Council, Moors Valley Country Park, Horton Road, Ashley Heath, Ringwood, Hampshire, BH24 2ET. Contact: Phil Baarda
Implementing organisation	N/a
Purpose/objectives	Monitoring of the frequency and patterns of fire events for EDDC habitat management purposes and deployment of resources.
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	c.1988
Finish date of data collection	On-going
Update frequency	Records made as fire events occur. Immediate update of central files.
Geographical coverage	EDDC heathland sites: 2 main heaths and 4 with small amounts of heath.
Habitat coverage	All habitats on sites included. Do distinguish different types of heath.
Is lowland heathland included?	Yes. Own system developed for habitat mapping purposes.
Details of all variables recorded	EDDC record a general narrative for fire events, this capturing information the wardens feel is important. No standard recording form is used. No classifications or groupings are employed.
Specific variables – fire location	Standard names for heaths are used. No compartments are recognised.
National Grid Ref	One, central six figure grid reference is recorded.
- timing	Date of start, and approximate start and end times recorded.
weather conditions	Noted in the narrative.
boundary i.e. extent	Approximate area burnt marked on a map (if more than a very small fire). Area burnt is estimated in hectares.
fire maps	Approximate area burnt marked on a map (except for small fires)
cause or causes	Recorded descriptively, if known
fire type/intensity	Noted in the narrative.
nature/severity of ecological damage	Descriptive notes on the habitats affected plus any dead or injured animals. May be subsequent monitoring, for larger fires.
Name of data holder(s)	East Dorset District Council
Contact person	Phil Baarda
Postal address	East Dorset District Council, Moors Valley Country Park, Horton Road, Ashley Heath, Ringwood, Hampshire, BH24 2ET.
Email address	p.baarda@eastdorsetdc.gov.uk
Internet address	None
Access terms	No standard terms.
Copyright	EDDC ownership.
Constraints on use?	None
Data format	100% in written reports, with maps.

Are data available digitally:	No
i Platform on which held	N/a
ii Digital file formats available	N/a
iii Indicative size of data set (MB)	N/a
iv Supply media	N/a
Accuracy/quality assurance measures used	No QA methods employed.
Data security procedures	Virus checking is standard. Regular backups of stand alone PCs to disc. No duplicates of paper records
Supporting documentation:	No supporting documentation for the fire recording system. No standard data definitions used. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes
If not what other variables/information would you find useful?	N/a
How are the data shared within and between organisations?	Not routinely shared. May be provided in response to specific requests.
What are the plans for on-going data collection?	Plan to continue as now.
Any other information	Fires are quite rare events, and mainly small (e.g. single trees).
Are these data available for this project?	Yes
If so, what is the best way of making these data available?	Records can be photocopied and provided.
Will there be conditions attached to data release?	EDDC would require confidentiality, acknowledgement and copies of the project reports.

Date: 9.12.98 Interviewee: Mike Humphreys Organisation: **Dorset Police**	
Data source title	Incident reports
Description	Records for fire incidents attended by the police on heaths in Dorset.
Date of publication	Data not published
Commissioning organisation	Dorset Police, Force HQ, Winfrith, Dorchester, Dorset, DT2 8DZ. Contact: DC Mike Humphreys
Implementing organisation	N/a
Purpose/objectives	Primarily to enhance resource decisions pertaining to heathland fires.
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	? Probably many years ago!
Finish date of data collection	On-going
Update frequency	Records made as fire events occur. Automatically updated centrally.
Geographical coverage	Any heathland in Dorset.
Habitat coverage	All habitat type, with no distinction between different types of heath.
Is lowland heathland included?	Yes. No strict definition used.
Details of all variables recorded	The officer attending makes a general description of events which is radioed through to the control room where it is entered on screen into the incident logging system. The police focus on describing any common factors (e.g. person present, weather patterns) that may assist in understanding the circumstances in which the fire occurred. No standard data recording form is used. No classifications or groupings are employed, though heathland fires are often (but not always) allocated a specific code.
Specific variables – fire location	Generally rely on Fire Service records
National Grid Ref	Generally rely on Fire Service records
- timing	Record date and time of call.
weather conditions	Not recorded.
boundary i.e. extent	Not recorded.
fire maps	None.
cause or causes	Recorded descriptively, if suspicious. Note that the Fire Service include all suspicious events in their definition of malicious. For the police, however, malicious acts have to be proven as such.
fire type/intensity	Not recorded
nature/severity of ecological damage	Not recorded.
Name of data holder(s)	Dorset Police
Contact person	DC Mike Humphreys
Postal address	Dorset Police, Force HQ, Winfrith, Dorchester, Dorset, DT2 8DZ.
Email address	N/A
Internet address	None
Access terms	Standard terms are available that allow different levels of access.
Copyright	DP ownership
Constraints on use?	All records would have to be screened before release and "sensitive" information

	removed (e.g. names, addresses, accusations etc.)
Data format	100% report format.
Are data available digitally:	Yes
i Platform on which held	PC main frame system
ii Digital file formats available	Not sure if data are exportable. ASCII would be most likely.
iii Indicative size of data set (MB)	Not known.
iv Supply media	Disc
Accuracy/quality assurance measures used	No QA methods employed. Accurate to best of knowledge.
Data security procedures	System is password protected. A-drives are generally disabled. Regular system backups Associated paper work in filing cabinets.
Supporting documentation:	No supporting documentation. No standard data definitions used. Data lineage/version not recorded.
Do the data you gather meet your information needs?	Yes
If not what other variables/information would you find useful?	N/a
How are the data shared within and between organisations?	Not routinely shared. May be provided in response to specific requests.
What are the plans for on-going data collection?	Working on developing and improving the system, including perhaps introducing a standard proforma for wildlife incident reporting.
Any other information	Fire incidents are generally notified by the Fire Service who determines whether a police presence is needed (e.g. to facilitate access). The fire event records are less structured than normal because heath fires are not regarded as a crime. Thus there is less of a demand for detailed records and recording protocols. However this is currently being reviewed within the context of wildlife incidents more generally.
Are these data available for this project?	Yes.
If so, what is the best way of making these data available?	All records would have to be located and manually screened and edited before release. This would be a big task. The end result would be fragmented information that would add little (if anything) to the Fire Service records.
Will there be conditions attached to data release?	DP would require confidentiality, acknowledgement and copies of the project reports.

Date: 21.12.98 Interviewee: Alison Field Organisation: **Forestry Commission/Forest Enterprise**	
Data source title	Fire logs & Fire reports
Description	Narratives for fire incidents attended by Forestry Commission/FE staff on heaths in the New Forest District.
Date of publication	Data not published
Commissioning organisation	Forestry Commission, Forest Enterprise, The Queen's House, Lyndhurst, Hampshire, SO43 7NH. Contact: Alison Field, Forest Operations Manager
Implementing organisation	N/a
Purpose/objectives	Primarily to enhance resource decisions for effective expenditure of fire protection resources.
Requirement for fire event data	As above
Status	Data gathering on-going
Start date of data collection	Not sure
Finish date of data collection	On-going
Update frequency	Records made as fire events occur.
Geographical coverage	Land managed by the New Forest District, spanning Hampshire, Dorset, Wiltshire and Somerset
Habitat coverage	Woodland, plantations and open heath
Is lowland heathland included?	Yes. No standard definition adopted.
Details of all variables recorded	All initial reports of a fire are recorded in a Fire Message Record Book - date, time, source etc.. A fire log is recorded for every event attended, using form S121. This is based on a general narrative recorded in the field and includes fire incident number, date/time, fire danger rating, location, cause, areas burnt, fire fighting costs, value of land and claims for losses made. Full fire reports (form S122) are completed for relatively large fires (>5ha), where there was human injury, for arson events etc.. This provides more detailed information on vegetation type/conditions, weather details, risk assessment details, address details for person responsible/witnesses, full details of fire fighting, costs and values.
Specific variables – fire location	Heath and standard compartment names are recorded.
National Grid Ref	Recorded for centres of all fires
- timing	Start time recorded
weather conditions	Direction and strength of wind is reported to aid fire-fighting decisions
boundary i.e. extent	Fires of >2ha are mapped at 1: 10,000 scale. Area burnt is estimated in hectares
fire maps	Larger fires are mapped and photographs taken. The start point is normally recorded.
cause or causes	Recorded using standard categories: public accidental, public malicious, burning on adjoining land, railways, FC staff, Other (specified) or Unknown
fire type/intensity	Not recorded
nature/severity of ecological damage	Not recorded, though the economic value of any woodland habitat destroyed is estimated using standard formulae
Name of data holder(s)	Various
Contact person	Alison Field, Forest Operations Manager
Postal address	Forestry Commission, Forest Enterprise, The Queen's House, Lyndhurst, Hampshire, SO43 7NH. Tel: 01703 283141; Fax: 01703 283929
Email address	None
Internet address	www.forestry.gov.uk

Access terms	Standard conditions for FC data and information apply
Copyright	Not sure
Constraints on use?	None
Data format	100% paper format; summary information available as a spreadsheet
Are data available digitally:	In summary form only
i Platform on which held	To be advised
ii Digital file formats available	To be advised
iii Indicative size of data set (MB)	To be advised
iv Supply media	To be advised
Accuracy/quality assurance measures used	To be advised
Data security procedures	To be advised
Supporting documentation:	Detailed description of all procedures, what to record and how to complete recording forms available in the New Forest District Fire Plan
Do the data you gather meet your information needs?	Yes.
If not what other variables/information would you find useful?	
How are the data shared within and between organisations?	Extensive internal distribution. Respond to requests.
What are the plans for on-going data collection?	As now.
Any other information	FC have an elaborate system for daily fire risk assessment, operated for many years ('The Full Standard Method'). Currently most attention is focused on effective fight-fighting and maximising the speed of response. This is deemed more important than the recording of fire incidents. FC actively assists the Fire Service with access, fighting fires and damping down. The New Forest District Fire Plan (1998-2002) provide full details of assessments and prescriptions, emergency procedures and records and reports.
Are these data available for this project?	Harold Gillen has recently extracted details of heath fires from the logs and summarised these data in spreadsheet format. These data can be made available.
If so, what is the best way of making these data available?	A copy of the spreadsheet will be provided.
Will there be conditions attached to data release?	Acknowledgement and an opportunity to see the final reports would be appreciated.

Last page.