SPATIAL ANALYSIS AND PREDICTIVE MODELLING OF CLANDESTINE GRAVES FROM REARGUARD REPRESSSION OF THE SPANISH CIVIL WAR

by

Derek R. Congram
B.A., Honours Criminology, University of Windsor, 1998
M.Sc., Forensic Archaeology, Bournemouth University, 2000
M.A., International Politics, Université Libre de Bruxelles, 2003

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

In the
Department of Archaeology

© Derek R. Congram 2010
SIMON FRASER UNIVERSITY
Fall 2010

All rights reserved. However, in accordance with the Copyright Act of Canada, this work may be reproduced, without authorization, under the conditions for Fair Dealing. Therefore, limited reproduction of this work for the purposes of private study, research, criticism, review and news reporting is likely to be in accordance with the law, particularly if cited appropriately.
**Approval**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Derek R. Congram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree:</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>Title:</td>
<td><em>Spatial analysis and predictive modelling of clandestine graves from rearguard repression of the Spanish Civil War</em></td>
</tr>
<tr>
<td>Examining Committee:</td>
<td>Chair: Ross Jamieson</td>
</tr>
<tr>
<td></td>
<td>Associate Professor, Archaeology</td>
</tr>
<tr>
<td>Mark Skinner</td>
<td></td>
</tr>
<tr>
<td>Senior Supervisor</td>
<td></td>
</tr>
<tr>
<td>Professor, Archaeology</td>
<td></td>
</tr>
<tr>
<td>Dawnie Wolfe Steadman</td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td></td>
</tr>
<tr>
<td>Associate Professor, Anthropology</td>
<td></td>
</tr>
<tr>
<td>Binghamton University</td>
<td></td>
</tr>
<tr>
<td>David Ebert</td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td></td>
</tr>
<tr>
<td>Manager of Cultural Resource</td>
<td></td>
</tr>
<tr>
<td>Services, Parks Canada</td>
<td></td>
</tr>
<tr>
<td>Patricia Brantingham</td>
<td></td>
</tr>
<tr>
<td>Internal Examiner</td>
<td></td>
</tr>
<tr>
<td>Professor, Criminology</td>
<td></td>
</tr>
<tr>
<td>Ermengol Gassiot Ballbé</td>
<td></td>
</tr>
<tr>
<td>External Examiner</td>
<td></td>
</tr>
<tr>
<td>Professor, Prehistoria</td>
<td></td>
</tr>
<tr>
<td>Universitat Autònoma de Barcelona</td>
<td></td>
</tr>
</tbody>
</table>

**Date Defended/Approved:** October 14, 2010
Declaration of Partial Copyright Licence

The author, whose copyright is declared on the title page of this work, has granted to Simon Fraser University the right to lend this thesis, project or extended essay to users of the Simon Fraser University Library, and to make partial or single copies only for such users or in response to a request from the library of any other university, or other educational institution, on its own behalf or for one of its users.

The author has further granted permission to Simon Fraser University to keep or make a digital copy for use in its circulating collection (currently available to the public at the “Institutional Repository” link of the SFU Library website <www.lib.sfu.ca> at: <http://ir.lib.sfu.ca/handle/1892/112>) and, without changing the content, to translate the thesis/project or extended essays, if technically possible, to any medium or format for the purpose of preservation of the digital work.

The author has further agreed that permission for multiple copying of this work for scholarly purposes may be granted by either the author or the Dean of Graduate Studies.

It is understood that copying or publication of this work for financial gain shall not be allowed without the author’s written permission.

Permission for public performance, or limited permission for private scholarly use, of any multimedia materials forming part of this work, may have been granted by the author. This information may be found on the separately catalogued multimedia material and in the signed Partial Copyright Licence.

While licensing SFU to permit the above uses, the author retains copyright in the thesis, project or extended essays, including the right to change the work for subsequent purposes, including editing and publishing the work in whole or in part, and licensing other parties, as the author may desire.

The original Partial Copyright Licence attesting to these terms, and signed by this author, may be found in the original bound copy of this work, retained in the Simon Fraser University Archive.

Simon Fraser University Library
Burnaby, BC, Canada
STATEMENT OF ETHICS APPROVAL

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

(a) Human research ethics approval from the Simon Fraser University Office of Research Ethics,

or

(b) Advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University;

or has conducted the research

(c) as a co-investigator, collaborator or research assistant in a research project approved in advance,

or

(d) as a member of a course approved in advance for minimal risk human research, by the Office of Research Ethics.

A copy of the approval letter has been filed at the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Simon Fraser University
Burnaby, BC, Canada

Last update: Spring 2010
Abstract

Over 100,000 non-combatants lie in unmarked graves across Spain, victims of deliberate killings committed by the rearguard during the Spanish Civil War (1936-1939). The side of the conflict that is responsible for the killings, the “Nationalists”, won the war and set up a dictatorship that governed Spain until 1977, prohibiting investigations of the killings. In 2000, civil groups began locating and excavating the graves in an attempt to identify, repatriate and memorialize the victims.

The purpose of this study is to detect spatial patterns of clandestine burials of the victims in Spain in order to facilitate victim recovery. The data analyzed come from excavated burial sites of victims who were killed in the rearguard of the Spanish Civil War. Spatial analysis and predictive modelling are used to analyze different variables, influential in the decision making process of the killers, taking into account killer objectives and constraints. Three predictive models are created using inductive and deductive approaches. Results of statistical tests and predictive modelling demonstrate patterns in kill site selection but also indicate shortcomings due to data availability, analytical limitations and the complexity of killer behaviour. This thesis demonstrates that the clandestine grave locations in Spain are patterned, resulting from killer behaviour that is logical and quantifiable. The results can help locate further missing persons.

This study represents the first of its kind in the field of forensic archaeology and advocates greater use of analytical methods such as spatial analysis and predictive modelling. The study also advocates a theoretically informed approach in forensic archaeological research and practice. The methods and the patterns identified in this study set a precedent for similar analysis in other contexts for the investigation of missing persons, victims of enforced disappearance.

Keywords: forensic archaeology; forensic anthropology; clandestine graves; archaeological predictive modelling; spatial analysis; Spanish Civil War
Dedication

This work is dedicated to the family members of victims of enforced disappearance in Spain. The families are also victims of an ongoing crime and it is hoped that work such as this can help bring them closer to moral, judicial, social and psychological reparation. Investigations into such crimes should always put the interests and desires of these families first.

Secondly, this work is dedicated to my wife and colleague Ariana Fernández.
Acknowledgements

There are many people who made a positive contribution to my research and thesis, only some of whom I can mention here. Mark Skinner: when I asked him to recommend good PhD programs he presciently detected that I was really asking for an opportunity to study under his tutelage. Thanks to David Ebert for his patience and tutorship as I waded into the world of GIS. For her editorial prowess and interest in the disappeared of Spain, thanks to Dawnie Wolfe-Steadman. Sonja Aagesen was inspirational, patient and of great assistance with GIS-related work.

En España: muchísimas gracias a la Asociación para la Recuperación de la Memoria Histórica (Santiago Macías, Emilio Silva, Fernando Magán) y la Zientzia Elkartea (Sociedad de Ciencias) Aranzadi (Dr. Francisco Etxeberria y Jimi Jiménez en especial) para la generosidad de su tiempo, experiencia, e información. También gracias a Marisa Hoyos (Nuestra Memoria Sierra y Gredos) y Dr. Francisco Ferrándiz (Consejo Superior de Investigaciones Científicas). Mas que todo, gracias a estas personas por su trabajo en la búsqueda, documentación, identificación y repatriación de los desaparecidos.

Este trabajo no habría sido posible sin el apoyo desde Madrid de José María Navarro Gómez (Arias), Marcos Díaz-Williams, Carmiña Jaramillo y Marta Williams.

Simon Fraser University and the SFU Department of Archaeology in particular assisted with financial, institutional, professional and other support. Particular thanks to Jon Driver, Mark Collard, Bob Muir, Merrill Farmer, Chris Papaianii, and Shannon Wood. Velma and Maurice Farquharson, my grandparents, gave me my first book on the Spanish Civil War and provided financial and inspiration support. Thanks to Mario and Gabriela Fernández, Jan and Chuck Congram.

This research was supported by a Social Sciences and Humanities Research Council of Canada Doctoral Fellowship.

Most importantly, thank you to Ariana Fernández and Sophia Congram-Fernández for their tremendous patience and the generosity of time and support.
# Table of Contents

Approval .......................................................................................................................................... ii
Abstract .......................................................................................................................................... iii
Dedication ....................................................................................................................................... iv
Acknowledgements .......................................................................................................................... v
Table of Contents ............................................................................................................................ vi
List of Figures ................................................................................................................................. ix
List of Tables .................................................................................................................................... x

1.0 Introduction ........................................................................................................................... 1
   1.1 Justification ......................................................................................................................... 2
   1.2 Objectives ............................................................................................................................ 4
   1.3 Thesis Outline ...................................................................................................................... 6

2.0 Forensic Archaeology, Spatial Analysis, and Predictive Modelling ................................. 8
   2.1 Forensic Archaeology ........................................................................................................ 8
      2.1.1 Grave Prospection ..................................................................................................... 11
   2.2 Spatial Analysis and Predictive Modelling in Archaeology ............................................. 13
      2.2.1 Geographic Information Systems (GIS) .................................................................... 16
      2.2.2 Archaeological Predictive Modelling (APM) ........................................................... 17
      2.2.3 Spatial Analysis in Forensic Investigation and Forensic Archaeology ..................... 23
   2.3 Conclusion ......................................................................................................................... 28

3.0 Concise History of the Spanish Civil War, Repression and Investigations .................... 29
   3.1 The Spanish Civil War ....................................................................................................... 29
      3.1.1 Foreign Aid and Influence ......................................................................................... 32
      3.1.2 Illegal Killings during the Civil War .......................................................................... 33
      3.1.3 Repression by the Nationalist Rearguard ............................................................... 35
   3.2 Historic and Modern Investigations of Civil War Killings in Spain ................................ 42
      3.2.1 Postwar Investigations of Nationalist Victims ......................................................... 43
      3.2.2 Investigations of Republican civilian victims .......................................................... 44
      3.2.3 Legal context ............................................................................................................ 52
   3.3 Conclusion ......................................................................................................................... 60

4.0 The Rational Act and Dynamics of Enforced Disappearance ......................................... 62
   4.1 Social Psychology, Ordinary People and Extraordinary Evil ........................................ 65
      4.1.1 The False Notion of Psychopathic Killers ................................................................. 66
      4.1.2 Proximate and Ultimate Causes of Mass Murder ...................................................... 69
      4.1.3 Summary of Waller’s Thesis ..................................................................................... 79
   4.2 Selective Homicidal Violence in Civil War ..................................................................... 79
      4.2.1 Local and Supra-Local Dynamics of Selective Violence ........................................ 81
7.2 Assessment of the Hypotheses ............................................................................................................ 203
7.3 Investigative Recommendations Based on Identified Patterns................................................................. 218
7.4 Future Study .............................................................................................................................................. 223
    7.4.1 Influence of Victim and Perpetrator Identities .............................................................................. 224
    7.4.2 Temporal Aspects......................................................................................................................... 225
    7.4.3 Influence of Other Places, Attractors ............................................................................................ 226
    7.4.4 Event Types................................................................................................................................... 227
    7.4.5 Technical and Methodological Considerations ............................................................................... 228
    7.4.6 Spatial Frameworks....................................................................................................................... 229
    7.4.7 Model Testing ............................................................................................................................... 231
7.5 Conclusion to Discussion .......................................................................................................................... 232

8.0 Conclusions .............................................................................................................................................. 234
8.1 Thesis rationale......................................................................................................................................... 234
8.2 Methods and Results............................................................................................................................. 235
8.3 Final Comments....................................................................................................................................... 239

Appendices .................................................................................................................................................. 245
Appendix A. Table of Exhumations of Republican Victims ........................................................................... 246
Appendix B. Gravesite Data Form (English translation) ............................................................................... 248
Appendix C. Sources and Details of Map Layers Analyzed ......................................................................... 250
Appendix D. Site Data, N=44 ..................................................................................................................... 251
Appendix E. Non-site Values for Statistical Tests, N=97 ............................................................................ 254
Appendix F. Sites and Non-sites in Castilla-Leon ....................................................................................... 257

Reference List ............................................................................................................................................. 258
List of Figures

Figure 3.1 People in Madrid protesting the prevarication trial against Judge Baltasar Garzón for his attempted investigation of crimes against humanity by the Franco regime leadership. Photo: AFP 2010.................................................................58

Figure 3.2 The son of a man who was executed, protesting the prevarication trial of Judge Baltasar Garzón. Photo: EFE/Alberto Morante. ................................................59

Figure 3.3 In general, the Spanish government has failed to fulfill its obligation to investigate the fate of victims of enforced disappearance from the Spanish Civil War era, inspiring political cartoons such as this one. ........................................59

Figure 5.1 Grave at Quintana de Rueda, Leon, post-burial disturbance evident in two of four skeletons being semi-disarticulated (foreground) ........................................131

Figure 6.1 Scatterplot showing correlation between population density at the origin site and the degree of density change to kill site .........................................................168

Figure 6.2 Inductive model suitability map for Castilla-Leon showing zones of high, medium, and low grave location suitability. Each zone is sub-divided into a further three zones. The inset at the bottom-left highlights the close-up in figure 6.3. ...................................................................................................................175

Figure 6.3 A larger-scale view of the suitability map produced by the inductive model in Castilla-Leon. .............................................................................................................176

Figure 6.4 The first deductive model grave suitability map showing three degrees of suitability in Castilla-Leon ..........................................................180

Figure 6.5 The second deductive model suitability map, as reiterated from the first deductive model, showing three degrees of suitability in Castilla-Leon............185

Figure 7.1 Boxplot showing the number of towns crossed by killers on the trip from ..........214

Figure 7.2 Graph showing distances of populated areas before and after kill sites.............215
List of Tables

Table 5.1    Deductive model independent variables and categories.................................................142
Table 6.1    Results for Univariate Moran’s I Test of Spatial Autocorrelation ............................158
Table 6.2    Descriptive statistics for continuous independent variables.................................162
Table 6.3    Univariate tests of significance for independent variables......................................163
Table 6.4    Bivariate tests of significance between independent variables.............................164
Table 6.5    Change of population density in travelling from origin/detention sites to kill sites........................................................................................................167
Table 6.6    Independent variables as recommended for consideration during stages of investigation...........................................................................................................171
Table 6.7    Summary of results for the inductive predictive model ................................................177
Table 6.8    Survey Statistic for Inductive Model ...........................................................................178
Table 6.9    Gain Statistic for Inductive Model .............................................................................178
Table 6.10   Chi-square goodness-of-fit test, inductive model......................................................179
Table 6.11   Summary of Results for the Deductive Predictive Model 1 ......................................181
Table 6.12   Survey Statistic for Deductive Model 1 .....................................................................182
Table 6.13   Gain Statistic for Deductive Model 1 .......................................................................182
Table 6.14   Chi-square goodness-of-fit test, deductive model 1 ..................................................183
Table 6.15   Summary of Results for the Deductive Predictive Model 2 ......................................186
Table 6.16   Survey Statistic for Deductive Model 2 .....................................................................187
Table 6.17   Gain Statistic for Deductive Model 2 .......................................................................187
Table 6.18   Chi-square goodness-of-fit test, deductive model 2 ..................................................187
Table 7.1    Survey Statistic for High Suitability Zone of Models (% Area:%Sites).......................194
Table 7.2    Gain Statistic for Models.............................................................................................195
1.0 Introduction

In 2007 I helped direct excavations of an informal and undocumented burial site of Spanish Civil War prisoners who died or were executed during a post-war repression. A local elderly man, whose father was among those allegedly buried at the site, was dying of stomach cancer. He said to me that he thought he would die before we found his father. I assured him that what he was saying was not true; that we would find all the graves and exhume all the victims before the end of the season. The old man told how when he was nine years old, two local fascists came to his house to return the mattress that his father slept on in prison: “Your father won’t need this anymore,” one of them said. Just to be clear the person added, placing his hand on the pistol at his hip: “This is the gun I shot him with. I shot him twice in the head” (Congram and Bruno 2007). In the fall of 2007 all of the graves at the site had been found and all of the bodies exhumed. At the time of writing this, none of those exhumed had been identified.

The primary goal of this study is to assist people with the search for clandestine burials, typically in the context of extrajudicial killings in times of armed conflict. Locating the bodies of missing persons is only one of many processes that are necessary to ensure the social, judicial and psychological reparation of surviving family and community members of the victims. Until a body has been found, however, little substantial evidence of a crime exists and thus the offense and the damage that results from it will continue indefinitely. Even when governments and courts are uninterested in fulfilling their legal obligations towards investigating crimes resulting in missing persons,
locating and recovering bodies helps document the circumstances of the victim’s death, identify the victim and facilitate their repatriation to their families for memorialisation.

1.1 Justification

The guilty leaders of the town, who deserted their men, were court-martialled. The guilty government of Largo Caballero, who left Malaga to her fate, was forced to resign. The guilty governments of the Western Democracies, which left the Spanish Republic to her fate, could neither be court-martialled nor forced to resign; they will be tried by History. But that will not make the dead arise (Koestler 1952:40)

In 1936, a failed military coup against a democratically elected Republican government led to a civil war in Spain. Researchers and investigators have determined that more than 100,000 non-combatants were executed and buried in unmarked graves, the victims of a brutal purge waged during and after the war by the “Nationalist” rebels, who went on to win the war (Espinosa 2009; Garzón 2008). Soon after winning the war, the Nationalists began investigations into the war-time killing of their supporters and soldiers, exhuming the bodies and memorializing them in town plazas, church walls, city streets and burying them in the massive mausoleum known as the Valley of the Fallen. Almost 39,000 bodies are registered as being buried at the Valley of the Fallen, although only 21,423 are identified (Junquera 2010a). Their victims, the so-called “Republicans”, were consigned to their anonymous, often mass burials.

Over 60 years after the end of the war and 25 years after the death of Nationalist General and Dictator Francisco Franco, a grass-roots search for the graves of the Republican victims began in earnest. Identifying who the missing are and where they are buried has been a tremendous challenge, due in part to the elapsed time since the killings but also because of the fear instilled by the former regime and the post-dictatorship “pact
of silence” (*pacto del olvido*) that was inherent in the transition from dictatorship to democracy (Espinosa 2006).

Despite these obstacles, between the year 2000 and 2006, about 100 clandestine gravesites in Spain were excavated and 940 bodies exhumed. The aim was to identify the remains and return them to surviving family members for dignified burial. In 2007 and 2008, about 2,000 more bodies were exhumed (Jiménez 2008). Although this seems like a positive trend, there is reason to believe that the rate will even out and perhaps decrease in the near future. This is, in part, because the most easily located graves will already have been found. In addition, the most reliable witnesses who were willing to speak will have done so.

Gómez and Junquera (2008) cite that the vast majority of the 170 graves excavated in 2008 were only possible through the oral testimony of witnesses to killings. This would suggest that oral testimony has been a reliable and functional tool for locating graves. What these authors do *not* mention is the number of times that oral testimony has failed investigators by identifying an alleged place in which it was revealed, through excavation, there was no grave. Much time has been spent digging for graves where graves never were, adding to the desperation of the victim families who requested the searches. Sometimes, even after long periods of time and despite traumatic circumstances surrounding killings, witness testimony can be surprisingly accurate (Wright 2010). Until an excavation has successfully located a grave, however, we cannot adequately judge the reliability of witness testimony. This places a tremendous burden on witnesses and those collecting their testimony and can result in tremendous waste of time, energy and money if the information given is wrong. Even in those instances where witness testimony is
valid, those who can provide it are fast dying of old age. Equally disturbing is the fact that the children of the missing are also dying of old age without ever having been able to place flowers at their parent’s burial place because that place is unknown. New and effective methods are urgently needed to continue the effective search for the missing in Spain.

1.2 Objectives

Crist (2001:44) emphasized that the theoretical paradigm of forensic anthropology (including forensic archaeology) embraces the concept that: “the behavior of human killers is patterned, as is the response of human remains to the range of possible perimortem and postmortem events that affect them”. The main hypothesis being tested is that in times of civil war – in this case the Spanish Civil War – crimes of enforced disappearance generally take place in a systematic, consistent and patterned manner. A premise on which this hypothesis rests is that despite the atrocious nature of the crimes, the killers are guided by a thoughtful, comprehensible and quantifiable logic when selecting kill site locations. This thesis will test anecdotal statements about the Spanish Civil War repression such as that made by Armengou and Belis (2004:28):

...the existence of a pre-established plan was also demonstrated by the fact that the repression was applied in the same manner in all the places that were conquered by the rebels. It only varied in its intensity, but the events that took place were the same and it also took place where there had been no war: there had been no enemy against which to fight militarily, and, despite this, real massacres took place.
Couffon, in Gibson (1973:73), made a similar observation: “The mopping-up operations practised by the Black Squads have an evocative name: *el paseo* ["the stroll"]. They are carried out to such a characteristic pattern that one can talk of a method”.

The literature produced by journalists and historians who have studied the repression of the Spanish Civil War (and other wars) is replete with similar statements. Despite this, the work of locating the victims by identifying the methods or manner that killers apparently employed has never been applied in a systematic way.

This study examines extra-judicial killings and clandestine burials committed by the Nationalist rearguard of the Spanish Civil War. The goal of finding the location of clandestine burials of victims of extrajudicial execution is accomplished through several objectives:

- The analysis of perpetrator behaviour, their objectives and constraints when taking their victims out to be killed;
- The identification of environmental and cultural variables that influence the perpetrators’ selection of kill sites;
- Statistical testing of the variables to establish how they influence site location decisions;
- The development of inductive and deductive predictive models to create location suitability maps that can be used to assist grave prospection.

In fulfilling these four objectives, it is hoped that the identified site location patterns and predictive models will assist those who are searching for the clandestine graves of the tens of thousands of non-combatants who were executed by the Nationalist
rarguard and who continue to lie in anonymous, undiscovered graves in Spain. It is also hoped that as a result of this work, the scope of grave location and the manner in which it can be successfully conducted are better understood so that the state will accept its responsibility to lead investigations on behalf of victim families.

1.3 Thesis Outline

Following this introduction, Chapter 2 provides some context and a framework within which this study was conceived and designed: spatial analysis and predictive modelling in archaeology, and how they relate to forensic archaeology. In Chapter 3, I present the study setting: the course of the Spanish Civil War and repression of civilians who were perceived by the Nationalist rebels as enemies, killed and buried clandestinely as a result. This chapter describes the investigation of those who died on both sides of the war but focuses on those whose deaths have never been formally investigated; those who, until recently, were condemned to remain in unmarked burials for having been seen as on the “wrong” ideological side of the war. Rather than developing arguments for the study, both of these chapters present a summary of background information for the development of the predictive models, hypotheses, statistical tests of variables, results and discussion that come in subsequent chapters.

In Chapter 4, I discuss the rational nature and form of the selective killing of civilians in civil wars. I argue that the social and environmental constraints that are imposed by intra-national conflict result in a degree of consistency in behaviour of those dedicated to the physical elimination of their ideological enemies. I present many examples from the Spanish Civil War that demonstrate this approach. This chapter forms the basis of understanding killer behaviour that results in extrajudicial execution of
civilians and the creation of anonymous, often mass graves. In Chapter 5 – Materials, Methods and Limitations – I outline a series of analyses starting with simple univariate and bivariate correlative tests between grave location and different environmental and cultural variables. In the next stage of analysis I develop three predictive models: one inductive, which is grounded in data from 44 previously discovered and excavated graves; and two deductive, which are derived from theoretical propositions developed from literature on violent killings in war and personal experience in eight countries over 10 years investigating these types of events.

In Chapter 6, I present the results of the analyses and predictive models. In Chapter 7, I discuss the significance and usefulness of the findings and make recommendations for those investigating missing persons in Spain based on the results of the statistical tests and predictive models. I conclude the chapter with suggestions for future study. Chapter 8 concludes with a brief overview of the work.
2.0 Forensic Archaeology, Spatial Analysis, and Predictive Modelling

This chapter gives a brief history of forensic archaeology as a discipline and discusses how this thesis fits with the objectives and tools of the discipline. Spatial analysis and predictive modelling are introduced as they relate to archaeology and the great potential that these have for advancing the study and practice of forensic archaeology is discussed.

2.1 Forensic Archaeology

Forensic archaeology is the application of archaeological theory and methods to medico-legal investigations. Typically, forensic archaeologists are employed in the search for, documentation and recovery of human remains and related evidence that is scattered across the ground or buried. In the Americas, where archaeology is typically categorized as a subfield of anthropology, forensic anthropologists are generally considered to be also forensic archaeologists (Dirkmaat et al. 2008; Connor and Scott 2001). In other countries such as the United Kingdom, forensic archaeology and anthropology are seen as distinct disciplines (Hunter et al. 1996; Hunter and Cox 2005). In continental Europe forensic anthropology is generally taught in medical schools and forensic archaeology is relatively undeveloped (e.g., Hunter et al. 2001).

The earliest published article explicitly naming and defining forensic archaeology was published in the Journal of Forensic Sciences in 1976 (Morse et al.). Since this time,
there have been many publications advocating archaeological methodology for the investigation of crime scenes involving human remains and buried evidence (e.g., Bass and Birkby 1978; Connor and Scott 2001; Skinner and Lazenby 1983; Sigler-Eisenberg 1985; Hunter et al. 1996; Melbye and Jiménez 1997; Haglund and Sorg 2002). Another important contribution is the semi-annual compilation of a bibliography related to crime scene interpretation with emphases in forensic geotaphonomic and forensic archaeological field techniques by Hochrein (2008).

Much forensic archaeological practice has been in the context of large-scale investigations of genocide, crimes against humanity and war crimes that have required the prospection and excavation of clandestine mass graves (e.g., Congram and Steadman 2009; Connor and Scott 1996; Flavel and Barker 2009; Fondebrider 2009; Haglund et al. 2001; Skinner 1987; Skinner et al. 2003; Tuller and Djuric 2006; Wright et al. 2005). A result of this work, which started in the 1990s, has been the increasing use of archaeologists and archaeological methods in conventional crime-scene contexts (e.g., single homicide investigations) and the creation of several forensic archaeology university programs, particularly in the United Kingdom. Although forensic archaeology – as distinct from or a sub-discipline of forensic anthropology – is becoming better developed, understood and applied, it will inevitably play a subordinate role to forensic anthropology as the most important evidence of a crime and victim identification lies with human remains. This disparity of attention between forensic anthropology and forensic archaeology (sensu stricto) is evidenced by the amount of text dedicated to each in the comprehensive and representative text *Handbook of Forensic Anthropology and Archaeology* (Blau and Ubelaker 2009).
There has been some debate about different types of forensic archaeological and anthropological practice, differentiating judicial and humanitarian work (e.g., Komar and Buikstra 2008: 249, 250; Cordner 2005; Dirkmaat et al. 2005; Scott and Connor 2001) although this is a false dichotomy as judicial and humanitarian objectives are not mutually exclusive (Congram and Steadman 2009; Steele and Congram 2008; Stover and Shigekane 2002). The lack of distinction between “forensic” and “humanitarian” projects is evidenced by the fact that personnel from the International Commission for Missing Persons, responsible for identifying and repatriating those who died during the wars in the former Yugoslavia (i.e., “humanitarian” aspects), have given evidence at criminal trials at the International Criminal Tribunal for the former Yugoslavia (Parsons et al. 2010). Nevertheless, for some investigations such as those of killings from the Spanish Civil War and post-war repression (1936-1975), there have been no criminal legal directives for or ramifications of investigations, (although judges and/or the police in Spain have attended the scene of some Civil War exhumations) and so some might view these as strictly humanitarian (see the next chapter for greater detail on investigations in Spain).

Dirkmaat et al. (2008) reviewed the state of forensic anthropology, noting the role of the practitioner as having expanded from a laboratory-based identification effort to one involving a broader range of objectives. These roles and methods that answer these new objectives include archaeological techniques of spatial analysis and the use of computer technologies in recording and examining mass disaster and complex grave features. The expanding use and role of archaeologists in medico-legal contexts has paralleled increasing demands for stricter and more rigorous methods as mandated through case law
in Canada (*R v Mohan*), the United States (*Daubert v. Merrell Dow Pharmaceuticals*) and the increasing use of expert witness archaeologists and anthropologists by defence counsel (*Christensen and Crowder 2009; Congram and Mundorff 2009; Skinner and Bowie 2009*, see also *Neufeld and Scheck 2010*) and the recommendations of reports on the state and practice of forensic science (*National Academy of Sciences 2009*). As a response, organizations such as the International Association for Identification and the recently formed Scientific Working Group for Forensic Anthropology (web site) have been working to establish standard operating procedures and accreditation systems for experts in forensic anthropology and archaeology. Another important development is the suggested protocols for mass grave excavation by *Cox et al.* (2008).

### 2.1.1 Grave Prospection

The most common task and also greatest challenge for forensic archaeologists is the prospection for clandestine graves. Typically searches rely on a combination of witness interviews (often including family members of victims) and surface surveys of suspicious areas, prior to test excavation. In 1990 *Killam* published a text on various methods used to search for clandestine graves that covered methods such as foot searches, probing for soil resistance, methane gas detection, geophysical survey and remote sensing. *France et al.* (1992) conducted controlled studies of buried pigs using several methods from various applied fields including aerial photography, botany, thermal imagery, entomology and geophysics. In 1997 *France et al.* published a follow-up study highlighting the advantages and disadvantages of various methods.

Increasingly, more advanced technologies are being employed such as satellite or airborne remote sensing (*Kalacska et al. 2009; Kalacska et al. 2010*) and geophysical
techniques (e.g., Buck 2003; Cheetham 2005; Nobes 2000; Schultz 2007; Strongman 1992). The necessity of specialized and experienced operators and the equipment requirements for the above methods, however, has often resulted in a reliance on more conventional methods of visual survey and low-tech methods such as probing for soil compaction (Owsley 1995). As identified by France et al. (1997) most prospection methods have limitations that relate to the nature of the search area: characteristics of the soil, geology, hydrology, climate, etc. For this reason fairly specific background information is necessary to properly assess which methods hold the most promise for searches in a location prior to a search. Positive identification of subsurface anomalies using non-destructive prospection methods generally require excavation to ascertain the nature of the anomaly. The search for missing persons and clandestine graves from the Spanish Civil War using advanced technical methods has depended mostly on the pro bono services of Luís Avial, a contract geophysicist from Madrid who has conducted ground penetrating radar surveys and infrared photography at over 90 alleged gravesites (Condor Georadar nd; García Calero 2009)

Unsurprisingly, failed prospections are seldom published except in the popular press (Associated Press 2008; Junquera 2009; Martín Arroyo and Cortés 2009). A negative result of this is that people may have a biased perception of the success rate of forensic grave prospection. The experience of this author and others in twelve countries suggests that only about 30 to 50 percent of cases of suspected clandestine graves conclude with a grave being found when sufficient evidence exists to warrant a search
(i.e., a reasonably small area has been identified by a seemingly reliable source)¹
(Skinner pers. comm. 2010, Manning pers. comm. 2010; Sterenberg pers. comm. 2010)².
It is reasonable to believe that fewer than half of all clandestine graves are ever found. It is impossible to know how trustworthy allegations of clandestine burials are in the first place and so no reliable conclusion can be drawn about the success rate of finding actual graves. While some of the failure to find burials may be accounted for by post-burial grave alteration or destruction, competent archaeological practice will detect evidence of this in the form of, for example, disturbed soil with evidence of cultural or natural activity that explain the disturbance and absence of remains (e.g., Skinner et al. 2002). In many failed prospections, however, evidence of grave alteration or destruction is not found, leading one to conclude that a grave never existed at the location.

This failure rate demands more effective search methods because considerable resources are invested into investigating reports of clandestine graves due to the gravity of the alleged crimes. Apart from the above mentioned work, there is extremely little professional literature demonstrating experimental work that would enhance the ability to locate clandestine graves.

### 2.2 Spatial Analysis and Predictive Modelling in Archaeology

Spatial analysis was first implicit in work on settlement archaeology as demonstrated by Wiley in 1953 and other authors in the 1960s (Kvamme 2006:4;

---

¹ Following the recent war in Kosovo, investigations of many disturbed areas suspected to be mass graves, upon excavation, were discovered to contain the remains of only cattle or sheep. Subsequent investigations would show that many bodies of victims were actually removed from Kosovo to Serbia (Tuller et al. 2008:9).

² Although the majority of the forensic grave prospection work by these sources spans four countries in the former Yugoslavia, they also have experience in Afghanistan, Canada, Costa Rica, the Democratic Republic of Congo, East Timor, Iraq, Sierra Leone, Spain, the Ukraine, and the United Kingdom.
The more formal application of spatial analysis in archaeology, however, was adopted from the study of geography in the 1970s and 80s. In archaeology, spatial analysis examines spatial relationships at a variety of scales – amongst artifacts, features, structures, sites, site systems and the environment – to draw conclusions about past behaviour and infer causes of behaviour (Clarke 1977; Hodder and Orton 1976). Spatial analysis has evolved to examine the social influence over space, rather than strictly physical relationships (Ashmore 2004; Renfrew 1986). Lock and Harris (2006:43, 44) put it this way:

Space is characterized as a void in which human activities are carried out. It is treated as the same void everywhere and at any point through time, a neutral backdrop for processual spatial modeling. Place, on the other hand, is a culturally defined locale that acts as a medium for action and is part of human experience and activity.

The methods and theoretical frameworks that were developed and employed when spatial analysis was first adopted by archaeology (“New Archaeology”) have largely been superceded by post-processualism. Authors such as Ingold (1993) advocate a balanced view, acknowledging the confining features of environmental contexts but also allowing for a variety of interpretations by those who occupy places. Spatial analysis has decreased in use both for theoretical reasons but also because of a general “fear” of complex statistical methods (Shennan 1990:vii; Verhagen 2007:16; Wheatley and Gillings 2002:125). Wheatley and Gillings also characterize spatial analysis as an observational tool rather than one of interpretation, thereby superseding theoretical concerns (2002:125). Although Shennan’s *Quantifying Archaeology* (1990) has done much to dispel fears of statistical techniques, some authors emphasize the importance of using
spatial statistics over conventional statistics for their ability to better identify causes of
geographic patterns and distributions (Schwarz and Mount 2006; Wheatley and Gillings
2002). A shortcoming of conventional statistics in spatial analysis is their inability to
assess spatial autocorrelation (Schwarz and Mount 2006:167; van Leusen 1996). Spatial
autocorrelation refers to the fact that things which are nearer in space are more similar, or
have stronger relationships, than things that are more distant, known as “Tobler’s First
Law of Geography” (Sui 2009). Schwarz and Mount (2006:171) make the point,
however, that some spatially distributed data sets are not spatially autocorrelated and so
the use of conventional statistics might still be appropriate in certain circumstances.

Parker Pearson (2005) provides a good overview of spatial considerations in
mortuary contexts. Questions of territory, status, role, ritual, and belief are only a few of
the things that can be reflected by the spatial disposition of the dead, related objects,
features, structures and sites. Cannon (2002:192) states that: “Given the widespread
desire to maintain memory in response to death, and the equally widespread, if not
universal, link between memory and space, it is not at all surprising that mortuary
practices often center on the placement and spatial representation of the dead”. Cannon’s
statement can also be applied when the opposite of maintaining memory – forgetting – is
desired, as will be seen in this study. It is ironic, however, that so much that was designed
to be remembered in past funerary contexts is now lost, whereas those who were meant to
be forgotten such as the Republican victims of Nationalist violence in Spain, are now
actively being sought through the prospection and excavation of their clandestine graves.
This reflects the active negotiation, interpretation and manipulation of mortuary remains
(in a broad sense) by the living (Parker Pearson 1999). The dead who the living wish to
laud and who are desired as community members beyond their physical death are placed and labelled by the living in socially important places, such as cathedrals. The socially and politically marginalized may be made an example by their death or killing (e.g., a public execution in the town square), and their postmortem treatment generally spatially reflects the values and desires of the powerful living (e.g., mass burial in a remote section of a cemetery or outside the cemetery walls) (e.g., Saxe’s 8th hypothesis in Parker Pearson 2005:29, 30 or the phenomenon of ceallunaigh in Ireland, in Taylor 2002:1203).

2.2.1 Geographic Information Systems (GIS)

The development of, and advances in, Geographic Information Systems (also Geographic Information Science, or GIS), have greatly facilitated spatial data display and analysis. Kvamme (1999:154) defines Geographic Information Systems as: “collections of interrelated computer programs designed for the handling and processing of spatially referenced information”. GIS has enabled and encouraged spatial analysis in archaeology through its ability to store, analyze and visualize vast amounts of archaeological data (Kvamme 1999).

There are two ways of representing space on maps in GIS: vector and raster. Vector data is represented by points, lines and polygons and is the familiar form for most people as they are used, for example, on road maps: cities are polygons, small areas may be indicated as points and roads represented by lines. In raster form, data are represented as pixels, the size of which is defined by the study and attributes can be shown by colour. Different colour representation of lines is important to distinguish, for example, roads

---

3 Ceallunaigh refers to burial places in unconsecrated ground in Ireland, where un-baptized babies, strangers, suicides and unrepentant murderers are buried.
from political boundaries. As with digital photographs, pixel size determines the resolution of images. Users of a GIS may prefer to use a larger pixel size because they are studying very large areas and with larger pixel sizes, data processing is faster and storage of data is more practical. Pixelizing, or vectorizing, data in GIS can facilitate many types of spatial analysis. Kvamme (1999) cites archaeological predictive modelling as the most common area of GIS application in archaeology and one that continues to grow in popularity, particularly in the realm of cultural resource management. This study uses ArcView 9.3 software.

### 2.2.2 Archaeological Predictive Modelling (APM)

Fairly recent volumes by various authors demonstrate the utility of GIS for archaeological research and particularly for predictive modelling, also known as site location modelling (Conolly and Lake 2006; Mehrer and Wescott 2006; Wescott and Brandon 2000; Woodman and Woodward 2002). Using GIS, archaeological and other physical features are characterized by both their location and attributes, whereas cultural variables are visualized vis-à-vis environmental variables (in van Leusen 1996:182). An example of the environmental representation of cultural variables is the knowledge that certain plants were highly valued by a particular archaeological group: the social value is represented by an unnatural abundance of a certain plant. The areas in which these resources would have been available are thus considered favoured areas for resource extraction based on the known cultural values of resource desirability (Dalla Bona 1994a). Using GIS, one can overlay different map themes (e.g., soil type, site location, elevation) from which secondary data can be derived, such as slope or distance between site and bodies of water (Kvamme 1999). Visualization through GIS can lead to the
identification of possible patterns in data that can then be tested statistically. The goal of an archaeological predictive model is to turn information into prediction by reducing or prioritizing areas of archaeological interest (Warren 1990:91; Wheatley and Gillings 2002:165). APM helps identify the relationships of different variables with site locations and then predicts unknown site locations that share similar characteristics within the same study area (interpolation).

APM establishes probabilities of site presence across a landscape based either on theory about human behaviour (deductive models) or based on an analysis of known site data from a region (inductive models) (Kohler and Parker 1986:400). There has been debate about the nomenclature, though, as neither of these two model types is exclusively inductive or deductive (Altschul 1988; Church et al. 2000; Sebastian and Judge 1988:4). Inductive models examine the characteristics of a sample of known sites and use these to characterize more and less favourable areas for the location of undiscovered sites. Scaled site probability can be projected onto a map with every land parcel (the unit of analysis) coded according to its characteristics (Wheatley and Gillings 2002:90). The site location is considered the dependent variable while environmental and cultural variables that influence site location are treated as the independent variables.

Ebert (2000) and Sebastian and Judge (1988:5) have criticized inductive models for lacking explanatory power and Warren (1990:90) has referred to them as descriptive methods. Kvamme (2006:12, 13) and Wheatley and Gillings (2002:166), however, have argued that theoretical assumptions and derivations are implicit in inductive models. These models are generally created on the assumption that archaeological sites correlate with environmental variables, without necessarily having a causal relationship (Conolly
and Lake 2006:181). Some authors contend that with predictive modelling, the ability to locate sites is what matters, not why it can locate them (Dalla Bona 1994b; Lock and Harris 2006:49). This attitude reflects the fact that the vast majority of predictive modelling has been conducted in the context of resource management where planning aims to avoid disturbing archaeological sites and so one need not know why sites correlate with certain environmental features, simply that they do. Inductive models are also easier to create. The funding from governments and the private-sector that has driven much APM to date has therefore resulted in most models being inductive as is reflected in the professional literature.

Some authors criticize deductive models as relying on little more than conjecture and suggest that their typically low predictive power is a reflection of our poor understanding of past behaviour regarding site location decisions (Brandt et al. 1992; Kvamme 1992, 1999). The poor state of theory results in difficulty or impossibility of replicating deductive models; the reasons for varying weights given to different variables are not explicitly quantified (or quantifiable) (Kvamme 1999; Kvamme 2006:12). In addition, a lack of recent published deductive models that use the same evaluation methods as those of this study make comparison difficult or impossible. In the current study, however, behaviour is much better understood – in part because of the nearness in time, but also because of the extent of historical and criminological research that has been conducted on the events of the Spanish Civil War and the generalized behaviour that results in the killing of non-combatants in times of armed conflict (see Chapter 4). This study analyzes a behaviour and culture about which more is known and less assumed when compared with archaeological behaviours and cultures.
As mentioned above, the idea that inductive and deductive models are mutually exclusive methods is misleading: all models typically include elements of both deductive and inductive thinking (Kvamme 2006:12; Veljanovski and Stančič 2006:398; Verhagen 2007:14; Wheatley and Gillings 2002:166). More accurately, the labels inductive and deductive indicate the general approach taken by the modeller (Ebert 2002:7) and different approaches can produce very different results. For this reason, examples that rely primarily on each type of approach are employed in this study.

In either case, Kvamme (2006:6) gives three justifications for the development of archaeological predictive models:

1. Human behaviour is patterned with respect to the natural environment and to social environments created by humanity itself;

2. We know or can learn something about how people interacted with these environments by observing relationships between human residues (i.e., the archaeological record) and environmental features;

3. GIS provides a tool for mapping what we know.

Several problems exist with APM, however, such as distinguishing different site types (which at the time of creation related differently to environmental variables); changes in the landscape environment from the time of activity to the time of modelling; and sampling biases (which are obviously not unique to APM but which must be acknowledged) (Church et al. 2000; Kvamme 2006:17-21; see also Ebert 2000). Nevertheless, the continuing stream of publications on APM demonstrate that many practitioners view the limitations as minor and/or explicable when contrasted with the benefits derived from predictive models, particularly in the context of cultural resource management (Verhagen 2007:17, 18).
Predictive models can suffer two main types of error: wasteful (type I error) and gross (type II) (Altschul 1988:62). Wasteful errors – identifying high probability locations in which no sites exist – cannot be overcome as there is no guarantee that a favourable area has been taken advantage of in the past for the activity being modelled. The exception to this is in areas where the limit of activity is known, such as with this study. If there are ten people missing in a province and all have been found, one can cautiously presume that all other high probability areas identified may be dismissed as long as there are no further missing persons from areas near the border of the province (i.e., within reasonable driving distance)\(^4\). Gross errors are those that misleadingly place sites in low probability areas. When models are tested for their accuracy, gross error on known sample sites (and through field testing) can be assessed. Adjustment and reiteration of models should help reduce gross error.

To date, archaeological modelling has been largely based on environmental variables to the exclusion (or downplay) of cultural ones because the former are easier to identify and quantify (Gaffney and Van Leusen 1995, Kohler 1988:20; Lock and Harris 2006). Some authors have incorporated ethnographic research to help account for cultural factors (Dalla Bona and Larcombe 1996; Lock and Harris 2006). Even so, as mentioned above, cultural variables can be accounted for to a degree as they are reflected by environmental variables (e.g., as proxies for visibility) (van Leusen 1996). Environmental

\(^4\) During the conflict in Kosovo in the late 1990s, bodies of Albanian Kosovars that had been killed by the Serbian military were actually transported into Serbia as a means of hiding the victims (BBC 2010; Tuller et al. 2008). Similar extraordinary measures were employed by the Argentina military when they threw victims from airplanes while flying over the ocean (Bernardi and Fondebrider 2007:211) and of course the Nazis who transported detainees great distances before killing them (Rees 2005). Such exhaustive efforts to hide crimes of this nature accentuate the possibility of moving victims, pre- or post-mortem, long distances or taking extraordinary measures to confuse what would otherwise be a rational and practical pattern in body disposal.
variables as reflections of cultural factors are demonstrated in this study through, for example, the distances judged to be sufficient for travel to execution sites according to perceptions of socio-political sensitivity of the killings (see Chapter 5). The relatively short period of time that has transpired between the Spanish Civil War killings and current investigations of missing persons allow researchers to have a much more accurate and precise sense of cultural and environmental variables than would normally be available for archaeological modelling. This is true because in the case of the Spanish Civil War there are living witnesses who can describe the socio-political and physical environment of the time, or who can speak of the character and actions of individuals involved in the killings. There are also maps and documents available from the time of the killings. Furthermore, the phenomena of the war and repression have been well documented and studied – and continue to be so – by historians and others since the war.

Typically, the first stage of predictive modelling is conducting exploratory data analysis through univariate and bivariate statistical tests. This can give the researcher a preliminary sense of influential independent variables and also potential co-variation. One way of assessing influence is by testing for random distribution of sites using a two-sample significance test of association. Random samples are generated in the study area to be tested against known sites. If differences between the two samples are identified, one can reject the null hypothesis that archaeological site locations are randomly placed on the landscape (Wheatley and Gillings 2002:136, 137). As Kvamme (1990a) has pointed out, however, two-sample approaches are hampered by the fact that the characteristics of the population from which the samples are drawn are not directly observed.
2.2.2.1 Logistic Regression

A more advanced statistical test that can be used as a first stage of testing following univariate and bivariate tests is logistic regression (Kvamme 1990b:295; Schwarz and Mount 2006:169). Logistic regression is one of several statistical procedures that are called probability models and is used for analyses in which the dependent variable is a binary measure (e.g., site or non-site). The regression function is a nonlinear relationship between the independent and dependent variables, and analysis of cases (e.g., land parcels) produces a probability between 0 and 1 for whether it is a non-site or site respectively (Warren 1990:99). Logistic regression is a powerful and consistent test and is appropriate for predictive modelling because it works well with any class of variable and with nonparametric data (Warren 1990:95, 96). In the context of archaeological predictive modelling, logistic regression measures the simultaneous influence of all the independent variables on the dependent variable. The relative values of independent variable influence can then be used to calculate the probability of site presence across a study area based on the characteristics of each land parcel’s characteristics.

2.2.3 Spatial Analysis in Forensic Investigation and Forensic Archaeology

There has been extremely little spatial analysis research published in the field of forensic archaeology. The few forensic archaeological texts that exist generally advocate simple scene mapping methods using string grids and compasses or even outmoded transit levels (e.g., Connor 2007; Dupras et al. 2006). Spatial recording methods and excavation methods with spatial implications have received much attention in recent years as advocated for mass disaster or other forensic scenes (e.g., Dirkmaat and Adovasio 1997; Haglund et al. 2001; Morton and Lord 2002; Roksandic 2002; Scott and
Conner 1997; Tuller and Djuric 2006). Modern technologies such as electronic theodolites and global positioning systems (GPS) are making data collection and documentation easier and faster. Listi et al. (2007) conducted research on GPS units and advocated them for mapping human remains and related evidence that is scattered across larger areas. Sorg et al. (2010) presented a GIS-based system designed to document, visualize and, potentially, analyze taphonomic data. However, as Dirkmaat et al. (2008:40, 41) note:

Whereas most forensic investigators are aware of the state-of-the-art improvements in data acquisition techniques and instrumentation (GPS, GIS, Total Station systems, hand-held scanners, etc), the same general awareness is not as common regarding the recent developments in analytical techniques. Knowledge of these analytical improvements plays an important role in the design of field protocols, since these techniques, apart from being capable of addressing a wider range of questions, also require a greater amount of more precisely recorded data.

Analytical methods and research are only just beginning to appear in forensic archaeology literature and are mostly driven by taphonomic questions (e.g., Haglund and Sorg 2002). This is for several reasons: the relatively young age of the discipline; the ad hoc contract nature of most forensic archaeological work (and so methodology is never the primary research focus of the practitioner); time and resource limitations at forensic scenes; limitations related to the use and study of criminal legal evidence (including documents, data, scenes, etc.); the lack of academic and research framework in practice (i.e., practice better reflects cultural resource management than academic archaeology); and the fact that archaeological investigations have their formation and practice so strongly rooted in biological/forensic anthropology (as opposed to archaeology, sensu stricto, see Skinner et al. 2003). There appears to be a discrepancy between the academic framework of forensic anthropology as encompassing archaeology and forensic practice.
This author has worked with several forensic anthropologists (with either a masters and/or a doctoral degree) who –some by their own admission – have received no archaeological field training and experience by the time they first start work on a crime scene. This combined with the other reasons listed above result, unsurprisingly, in little research that is archaeological and, specifically, spatial.

There are some recent exceptions to this. Dirkmaat et al. conducted a spatial pattern analysis of randomness using Ripley’s K-function of commingled remains recovered from a quarry (2005). Although Dirkmaat et al. conducted their research on an archaeological site, their intention was to promote spatial analysis techniques in the forensic excavation of mass graves. Manhein et al. (2006) used GIS to assess human remains scattered across the ground surface to search for correlations between spatial distributions and time since death (another example of taphonomic-oriented research). Their results showed few patterns exist, but the research was novel and demonstrated an exciting new direction in forensic research. Tuller et al. (2008) published a spatial analysis of heavily commingled remains in a mass grave, demonstrating the probable association of separated body parts within the grave. Their results were largely confirmed by DNA analysis of the remains. These few and recent publications hopefully represent the beginning of new lines of forensic archaeological spatial research.

In only one instance has predictive modelling been tried for the prospection of mass graves and this is a fairly simple, unpublished study that acknowledges significant methodological limitations (Reddick 2006). Reddick’s study was of a series of primary and secondary mass gravesite locations in Bosnia and she used a correlative method (the “intersection method”, Dalla Bona 1994a), which assumes that all independent variables
have equal influence on grave location decisions and gives no explanation for any correlation observed. Reddick’s study considered four environmental independent variables (distance from road, road type, slope and land use). The study sample included graves of different event types (primary and secondary interments, execution sites). Although the model is only a minor part of a broader and interesting thesis, it fails to tests whether the location choices for different events were heavily influenced by cultural values (e.g., a stronger desire by perpetrators to create secondary graves in remote or well hidden areas, since the motivation for creating them in the first place was the discovery and investigation of primary gravesites by the United Nations). Despite its limitations, Reddick’s work touches on unexplored avenues of research and sets a positive precedent for the practice of forensic archaeology and anthropology and the investigation of missing persons.

One further possible explanation for the paucity of forensic archaeological research is the neglect of theoretical aspects of the discipline (e.g., Connor 2007, although also see Chapter 8 in Hunter and Cox 2005). In fact, forensic archaeology and forensic anthropology have been called “a-theoretical” (Crist 2001; Gould 2007). Similar to Kvamme’s defence of inductive models for likewise lacking theory, however, I would argue that theoretical assumptions and deductions are implicit in forensic archaeological work (e.g., ideas of criminal behaviour and how offenders, victims and others interact with natural variables to create and alter crime scenes). It is important to directly address theoretical questions and problems if forensic archaeology is to continue to mature as a discipline. A text by Komar and Buikstra (2008) emphasizes context and theoretical issues in forensic anthropology and is a fresh break from the typical and over-abundant
forensic anthropological work that reviews only technical methods of assessing biological profile and trauma analysis. The present study attempts to do more than just identify patterns of grave locations but also to explain the reasoning employed by the killers who selected them. This is developed further in Chapters 4 and 7. Further examples of theoretical aspects of spatial analysis for forensic research can be drawn from criminological work.

Spatial analysis in criminology relates strongly to a longer history of crime mapping (see Chainey and Ratcliffe 2005 for a comprehensive overview). Theoretical advances have been made with environmental criminology, particularly by the Brantinghams of Simon Fraser University (Brantingham and Brantingham 1981, 1984, 1993, 1995). There is some literature on body disposal sites of homicide and serial homicide victims that has more direct implications for forensic archaeology (e.g., Lundrigan and Canter 2001a; Lundrigan and Canter 2001b; Snook et al. 2005). What these authors demonstrate is that serial killers in different countries employ an “inherent logic” and are guided by rationality in their spatial choices of body disposal sites. In other words, rather than body disposal being a disorganized and unreasoned process, killers demonstrate calculated behaviour when deciding where to dispose of their victims. That these papers study serial killers in different countries supports the idea that behaviour patterns are based on factors that transcend cultural and political boundaries. These papers are focused on sociological and psychological factors and accentuate behaviour that constitutes a basis for theoretical work in forensic archaeology.

Finally, Rossmo (2000), a student of the above-mentioned Brantinghams, popularized the term “Geographic Profiling” with his work of the same name. While not
a single method *per se*, geographic profiling adopts an environmental approach to examine different spatial patterns of serial crime with the aim of predicting the most likely location or base of the offender. The work incorporates various theoretical concepts including Crime Pattern Theory, routine activity theory and rational choice theory. Geographic Profiling relies heavily on GIS has come to be adopted by various police services around the world. It is Rossmo’s text that inspired this study.

### 2.3 Conclusion

Although forensic archaeology is a young discipline, there have been very few publications that explore advanced methods of grave prospection, and discussion of theoretical issues are virtually absent. This study endeavours primarily to identify spatial patterns in killer behaviour, and secondarily to explain those patterns by testing the rationality, objectives and constraints of the killers. The tools employed here have been developed through archaeological use of spatial theory and concepts, which is also evidenced in environmental criminology.
3.0 Concise History of the Spanish Civil War, Repression and Investigations

This chapter gives a very brief overview of the course of the Spanish Civil. The focus is on issues relevant to the killings being studied in this thesis as well as their investigation by both private and public groups and individuals. This chapter does not intentionally advance a particular perspective or argument, although it does demonstrate that the controversy over the excavations of victim graves are due in great part to the effects of the dominant and one-sided Civil War narrative that was created during the Franco regime and that persists today. The failure of the Spanish government to fulfill its obligations under international law has left the families and communities of victims to assume the role of investigator.

3.1 The Spanish Civil War

In February 1936, a Republican government was elected in Spain. By March, military generals began plotting to overthrow the government (Beevor 2005:49; Jackson 1974:39; Payne 2006:312). In order to secure sufficient support for the coup, the rebel generals entered into negotiations with two primary groups: the traditionalist and Catholic Carlists (whose paramilitary soldiers were known as Requetés) and the political organization called the Falange (Beevor 2006:51; Payne 1967:329; Thomas 2003:163-165).
On July 17, 1936, military generals and high ranking officers including Francisco Franco, Emilio Mola, José Sanjurjo, Gonzalo Queipo de Llano and Juan Yagüe attempted a military coup starting in the Spanish colony in Morocco. Rebel troops from Morocco were transported to the south coast of mainland Spain and their military campaign moved west and then north along the Portuguese border under the command of Generals Yagüe and Franco. The Nationalist army in the north was commanded by Emilio Mola in Burgos.

These rebels came to be known as the Nationalists, while those in support of the standing government were Republicans (e.g., Thomas 2003). It is important to note, however, that such labels dichotomize a population and conflict noted for its disparate groups and subgroups (e.g., Orwell 1938). Some of the distinct groups of actors, the roles they played and how they perceived and labelled one another are discussed in greater detail later in this and the following chapter.

Only some areas of Spain went immediately to the rebels, while others including the capital remained loyal to the government. Within four days, the insurgents had control over a third of Spain (Jackson 1974:48; Puell de la Villa and Huerta Barajas 2007). Within two months the northern and southern armies had connected their conquered territory and focussed their attention eastward towards the capital, Madrid (Puell de la Villa and Huerta Barajas 2007).

As Nationalist troops took over territory, they placed people in power to secure and govern the rearguard. Those given this responsibility were mainly former members of right-wing political parties, particularly the Falange, as soldiers and others with military training were needed for the continuing conquest of territory. Over a hundred thousand
deliberate killings of civilians occurred in the Nationalist rearguard and most of these in the first months following the attempted coup (Beevor 2006:81-94; Espinosa 2009; Garzón 2008; Juliá 1999).

From November of 1936, Republican government supporters successfully defended Madrid against sustained and concerted Nationalist attacks. It became apparent that the coup had failed and that a civil war was inevitable. Resistance to the coup was greater than anticipated by the insurgents and winning the war would require more military hardware, greater numbers of soldiers and a more organized effort to eliminate opposition and maintain control of conquered territory. Probably both as a consequence of the lack of personnel supporting the rebellion and the subsequent number of those potentially or actually opposed, the Nationalists instituted a policy of widespread repression that Thomas depicts as: “an act of policy, decided upon by a group of determined men who knew that their original plans had gone awry” (2003:249).

The Nationalists gradually took over new territory in the north and northwest of the country. In January of 1937, a meeting was held between the Nazi official Hermann Goering and Italian President Benito Mussolini (Germany and Italy were supplying and supporting the Nationalists) during which the Nazi leader claimed that the Nationalists would achieve victory within three weeks (Graham 2005:113). Goering was grossly mistaken and throughout 1937 and 1938 battles were waged and won by both sides but the Nationalists proved more capable of taking and keeping territory. In March 1939, the Republicans ceased to resist. Madrid, and all of Spain, was taken by the Nationalists. On April 1 Franco, as leader of the Nationalist forces, declared an end to the Spanish Civil War. His dictatorship lasted until his death in 1975.
3.1.1 Foreign Aid and Influence

Even before the coup, rebel leaders had been communicating with the Nazis and Italian fascists seeking their support (Brenan 1960:310, 311). From the outbreak of the war, various governments outside of Spain debated the consequences of their involvement and support for either side. Two days after the rebellion began General Franco formally requested German and Italian aid (Jackson 1974:49). On August 2\textsuperscript{nd}, the French government proposed a Non-Intervention Agreement, which Germany and Italy signed but ignored (Jackson 1974:50). German and Italian violation of the agreement along with general respect for it by the French and British worked against the Republic throughout the war (Graham 2005:37).

The progression from a failed coup to the outbreak of a war and with the country’s fighting forces divided into two, the Nationalists and Republicans both sought resources (particularly war matériel such as planes, tanks, guns) from other countries (Beevor 2006:132; Carr 1986:127, 136). The rebels had received advance support from Germany and Italy for the proposed coup and as it became clear that the coup had failed German and Italian planes flew Nationalist troops to mainland Spain from northern Morocco to wage war (Atholl 1938:50-61; Graham 2005:24). The Soviet Union, seeking to keep the Germans and fascism in check, went to the aid of the Republic. The Soviets agreed to support the Republic in mid-September and deployed in November (Graham 2005:40). Soviet support waned, however, as it became apparent that the Nationalists could not easily be stopped and that the Republic would be unable to pay them for the increasing cost of their support (Beevor 2006:328, 364; Ranzato 1999:109). In February

\footnote{For a summary of international assistance to both sides of the war, see Thomas 2003:934-944}
1939, more than one month before the surrender of Republican leadership and forces, the British, French and American governments recognized the Nationalist forces as the new Spanish government (Beevor 2006:387).

Due to the ongoing gross violations of the norms of war in Spain and the Non-Intervention Treaty, overt support by foreign nations to either side threatened their international reputations and credibility. Several authors note the shock and disapproval of German and Italian officials at the treatment and wide-scale killings of prisoners by the Nationalist forces (e.g., Jackson 1965:540; Reig Tapia 2006:541; Tremlett 2006:49). Nevertheless, their support and even active participation in atrocities, such as the Luftwaffe fire-bombing of the city of Guernica, continued. The opinion of foreign governments was critical to the Nationalists and influenced the form of violence and repression exercised by the Nationalist rearguard, as is discussed further in Chapter 4 of this study.

3.1.2 Illegal Killings during the Civil War

The Spanish Civil War has been characterized by the large-scale killings of non-combatants (Herreros and Criado 2009). Over the decades since the conflict, many authors have debated the number of victims of the war and particularly the non-combatants who were executed summarily or following courts martial by both sides of the conflict (e.g., Beevor 2006:81-94; Espinosa 2007:431-434; Jackson 1965:535; Juliá 1999; Reig Tapia 2006:549; Zavala 2006). Recent reliable accounts suggest that up to 150,000 people were executed by the Nationalists whereas 50-60,000 were killed by Republicans (Juliá 1999:407-413; Ruiz 2005). More recently, however, Espinosa (2009:440-443) cites 129, 472 victims of the Francoist repression (war-time and post-
war) and 38,563 victims of Republican repression. Casanova (1999:64, 65) estimated that 50-70 per cent of all Civil War executions took place in the first few months of the war.

These initial killings are generally characterized by so-called *paseos* and *sacas*, the former of which is studied in this thesis. Zavala traces the use of *paseo* to the American mafia of the 1920s and 30s and their use of the term “stroll”, or “walk” (e.g., “Let’s take him for a walk”). The term *saca* (“to take out, or remove”) refers to events whereby prisoners were “released” from prison, typically in large groups, to be shot. In official documents the prisoners were released but upon exiting the front gates, trucks with paramilitaries or civil guards would be waiting to drive the prisoners to their place of extra-judicial execution (Rilova Pérez 2001). Zavala (2006:95) distinguishes these two types of killings by calling *sacas* “industrialized” versions of *paseos*, meaning that they demonstrated greater coordination by the authorities and produced larger numbers of deaths for each killing event.

There has also been much debate about the nature of these latter killings by each party in the conflict although most authors agree that killings in the Nationalist zone were planned and, if not actively coordinated, they were at least tacitly encouraged by the military and civil authorities. Killings in the Republican zone, however, resulted mostly from a loss of civil and military authority to the rebels and a lack of control over reactionary forces which were anxious to take up arms and defend the Republic (Espinosa 2002:115-119; Graham 2005:30; Jackson 1965:305; Juliá 1999; Ranzato 1999:74; Reig Tapia 2006:525, 526, though also see Ruiz 2009). Herreros and Criado (2009) modelled the killings of civilians on both sides of the Spanish Civil War and concluded that there were two types of killings that coincided with the two parties in the conflict: pre-emptive
killings, which followed a strategic logic in the Nationalist zone; and arbitrary killings, which resulted from a loss of control and authority in the Republican zone.

This study examines the killings by the Nationalist rearguard only. This is for several reasons including the different nature of the killings, as described in the previous paragraph. Another reason for focussing on victims of one side of the conflict is because these are generally the graves that are currently being excavated in Spain. As mentioned in the introduction, the Nationalists staged a large-scale investigation and exhumations of those who were killed by the Republicans. Although limited data on those graves is available, the current investigations allow direct data collection and verification of details reported through site visits, discussion with those involved in grave excavations and report authors, etc. As no study has attempted to demonstrate that patterns in grave locations actually exist, it is prudent to begin with those from one side of the conflict before attempting to consider both as part of the same sample.

3.1.3 Repression by the Nationalist Rearguard

The repression took many forms, only the worst of which was summary execution. In one Nationalist prison in Burgos, prisoners were forced to attend Catholic mass where, behind the altar, were images of the Virgin Mary above images of Franco, Hitler and Mussolini (Castro 2006:232). For the luckiest of prisoners, such propaganda would be the worst of their punishment. Throughout the war, thousands of prisoners in Burgos and elsewhere in Nationalist territory would be taken out at night in trucks and executed without a trial (Rilova Pérez 2001:166; Silva and Macías 2003).
Of the more than 100,000 non-combatants killed by the Nationalists, 30-35,000 were killed by the rearguard during the so-called *verano caliente* (hot summer) of 1936 (Juliá 1999; Rodrigo 2008:75). These killings constituting the category of the largest number of deaths from the Civil War (Jackson 1965:533, 538) and upon which this study focuses.

Victims of *paseos* and *sacas* were killed and their bodies disposed of in one of several places and manners including cemeteries (both inside and outside), pre-existing features such as wells, quarries or trenches from the front lines, thrown off of bridges into ravines or, commonly in road-side ditches outside of populated areas (Silva and Macías 2003; Herrero Balsa and Hernández García 1984). In other instances, particularly at the beginning of the war, more elaborate means were used such as the burning of bodies (e.g., Reig Tapia 2006:529). This method was notoriously employed on the victims of the Badajoz massacre where, early in the war, thousands of prisoners were machine-gunned in the city bullring. Several international journalists reported on the killings and took photographs of the bodies being burnt (Espinosa 2006; Pons Prades 2006). As the Nazis were later to discover, however, burning bodies is not something that can be done easily (Auerbach 1979:38-40). It is clear that the use of fuel was necessary for burning bodies and given the restriction of resources and the tragic number of victim bodies that would have to be burned, the Nationalists accepted burial as the primary disposal method and often forced people uninvolved in the killings to bury them (e.g., Herrero Balsa and Hernández García 1984).
3.2.1 Perpetrators

There is near-unanimity amongst researchers of Nationalist violence in assigning the greatest responsibility for rearguard killings of civilians with the Falangists and Carlists, though mostly the former (e.g., Beevor 2006:89; Herreros and Criado 2009; Jackson 1965:533; Reig Tapia 2006:530; Thomas 2003:272, 273). Emilio Silva, president and founder of the non-governmental Association for the Recovery of Historical Memory (abbreviated as ARMH in Spanish), has stated that 98% of victims exhumed by the organization since 2000 were killed by members of the Falange (Junquera 2010a). Oblanca and Serrano (1987:80, 81) quote Raimundo Fernández Cuesta, a former falangist, admitting that “the Falangists did the dirty work: the shootings”, and referred to their role euphemistically as “public order services”.

Graham (2005:30) characterizes the killings in the first months of the war as a massacre of civilians by civilians, albeit with the tacit or explicit agreement of the Nationalist civil and military authorities. Although the Falangists and Carlists were not technically a part of the army at the time of the coup and beginning of the war many had been armed, had received prior military training of some sort and, as mentioned above, had voiced formal support for, and helped organize the coup (Thomas 2003:165, 174). Taking these things into consideration the Falange and Carlists are considered “paramilitary” in this study, which implies that they are ancillary to the military without having official status (Oxford English Dictionary 2007).

Although Jackson (1965:274) claims that the Carlists did not shoot their prisoners of war, he is probably referring to captured Republican soldiers and not murdered civilians. Beevor (2006:94) claims that the Carlists treated their prisoners of war “the
most correctly”, when compared to the Falange and Thomas (2003:248) and Beevor (2006:61) confirm that the Carlists were responsible for extrajudicial killing of civilians in Nationalist territory. The activity of the Carlists during the war was focussed in and around their geographic base at the north-eastern autonomous community of Navarra and in battle against the Basques (Beevor 2006:225-230). This study examines killings in the north-west around Castilla-Leon, where the Falange were generally given rearguard responsibilities, as confirmed by reports on excavated graves used for this study.

3.2.1.1 The Falange

In 1933, José Antonio Primo de Rivera, son of a former Spanish dictator, formed the fascist political party la Falange Española (Ranzato 1999:29). In 1935, the leaders of the Falange Española planned an insurrection against the government but it failed to advance due to their low membership numbers and a lack of support from the military (Payne 2006:310). The Falange’s lack of popularity was also evident in their failure to win any seats in Spanish parliament in the February 1936 elections (Armengou and Belis 2004:32; Thomas 2003:148).

Soon after the 1936 elections there was increasing disorder in Spain. In an attempt to disturb the peace and justify their call for a different, more orderly government, (an obvious contradiction), members of the Falange roamed around Madrid in cars, armed with machine guns committing arson and murders (Brenan 1960:310; Thomas 2003:153, 154). Beevor (2006:40) asserts that this disorder actively provoked the coup. Ranzato cites Falange leader José Antonio as describing the actions of his group as the “dialectic of fists and pistols” (1999:29). On March 15 a Falangist placed a bomb at Socialist Party Leader Largo Caballero’s house. The Republican government reacted by placing José
Antonio under arrest and declaring the Falange political party “illegal”, which served to
encourage plans for the coup (Payne 2006:310; Ranzato 1999:49).

At the time of the coup, many Falange members were under 21 and over half were
poorly educated students (Brenan 1960:308; González Cuevas 2000:292; Thomas
2003:110). The organization probably appealed to these people who saw an alternative to
the polarized battle between the far right and the far left that typified Spanish politics of
the 1930s. Although the majority of Falange members were from the lower middle class,
the organization also attracted single males from wealthy families including leader Jose
Antonio (Beevor 2006:40; Thomas 2003:10, 273). Though the military leadership in
general were not supporters of fascism or the Falange, the support of the group was
deemed necessary to the coup and Nationalist movement (Payne 1967:376).

At the end of February 1936, Thomas (2003:154) estimates that the Falange
probably numbered less than or equal to 25,000. By late spring, however, their numbers
grew rapidly to about 60,000 and upwards of 2,000,000 during the war years (Jackson
1965:418). Part of this increase results from opportunists, the Falange having gone from a
political party disenfranchised by the 1936 elections to the only party recognized by the
Nationalist authorities. The threat of violence against those who did not support the
movement in the Nationalist zone and an increasingly apparent victory as the war
progressed also explains increasing membership in the Falange.

Since the Falange were poorly trained, militarily, they became responsible for the
so-called “cleaning up” (limpieza) in the rearguard, for rounding up and executing all
possible opponents of the Nationalist movement (Bennassar 2005; Ranzato
1999:30). Their less dangerous rearguard responsibilities would also have made
membership in the Falange attractive to many people who felt pressured to join the Nationalist cause but wanted to avoid combat. This combination of circumstances facilitated the leading Falange role in extrajudicial killings and the increasing number of members ensured that there was no shortage of people to commit the killings.

In November 1936, after a court martial, Republican authorities executed Falange leader José Antonio Primo de Rivera. By the spring of 1937, front lines were stagnating and a prolonged civil war was apparent. General Franco seized on the lack of strong Falange leadership and, as part of his efforts to better coordinate and control Nationalist paramilitary forces, united the Falange with other militia under the new name *Falange Española Tradicionalista y de las Juntas de Ofensiva Nacional Sindicalista* (Spanish Traditionalist Phalanx of the Assemblies of National-Syndicalist Offensive) (Bennassar 2005; Payne 1967:377; Thomas 2003:621). Around the same time, Franco instituted greater use of courts martial, allowing for an alternative to *paseos* and *sacas* as a way of eliminating the enemy. Although *paseos* and *sacas* continued after the union of Nationalist paramilitaries, they decreased in frequency (Casanova 1999:171-177). This assertion of control by Franco and a move to a more “legalized” process of killings allowed the Nationalists to appease foreign governments who favoured non-intervention.

The Falange has been clearly demonstrated as the principal group responsible for the killings investigated in this study. The manner and form of political control exercised by the Falange over the course of the war provides a timeframe within which most of the killings under study took place.
3.2.2 Victims

The failure of the military coup indicated that the rebel generals had overestimated popular discontent with the government. Their task of taking over the government was more difficult than they had foreseen and extraordinary measures would be employed to convert or destroy opposition to their authority. In tens of thousands of cases, the result was the summary execution of non-combatants perceived to be ideological enemies.

Freemasons, leaders and members of Popular Front parties, trade unions, and in some areas even those who had simply voted for the Popular Front in the February elections were arrested and many shot. Those who participated in strikes at the time of the rising, anarchists, doctors, school masters and intellectuals were shot. Even the wives, sisters and daughters of men executed occasionally shared their fate (Beevor 2006:88, 89; Jackson 1965:302; Thomas 2003:248-255). Whitaker (1942:104, 105), who was in Spain during the war, noted that victims of Nationalist rearguard killings often belonged to neither side. Graham (2005:29) sums up the victim profile this way: “people of all ages and conditions [who] were perceived as representing the change brought by the Republic... people who symbolized cultural change... progressive teachers, intellectuals, self-educated workers, ‘new’ women. Rebel violence was targeted against the socially, culturally, and sexually different”. Although this victim list is broad, it sufficiently demonstrates that they were civilians who posed a political or social threat to the rebels and were not combatant enemies.
3.2 Historic and Modern Investigations of Civil War Killings in Spain

Kalyvas (2006:34, 35) notes that the violence of civil war is generally a topic investigated only by journalists, human rights activists, anthropologists and historians and that the work is largely descriptive, rather than analytic. This has generally been true of the study of killing of civilians during the Spanish Civil War until recently (Herreros and Criado 2009).

Investigations by various persons or organizations have taken place both during and following the Spanish Civil War. The preponderance of propaganda distortions and inventions from the war and subsequent dictatorship, however, has proven to be a significant stumbling block to those seeking accurate details (Reig Tapia 1988; Thomas 2003:251). During the war jurists, journalists and artists made the violence their preoccupation and in general constituted the most consistently reliable sources of information, although even their accounts are now known to have been fallible (Sevillano Calero 2004:27; Reig Tapia 1986:161; Thomas 2003:251, 254 fn; also Orwell 1938; Mellow 1992 on Hemingway; Whitaker 1942). As with any crime, witness testimony carries more weight when supported by physical evidence.

Civil War and post-war repression victim grave excavations have provided the most telling evidence of crimes. Some exhumations occurred almost immediately after the killings, by families of the victims, although these were typically clandestine for fear of reprisal (Molina pers. comm. 2007; Macías pers. comm. 2009), which may explain the lack of printed testimony on these war-time or immediate post-war exhumations. Vilaplana (1977), as described further in Chapter 4, had the official task of investigating deaths prior to and during the war. Little reliable information is available from official
investigations at the times of the killings due to political interference in the Nationalist zone as described by Vilaplana. Cases cited by Zavala (2006) confirm that this is the case for the Republican zone as well. Rilova Pérez (2001) notes that limited facts about targeted rearguard executions have come to be known through three mechanisms: formal investigative bodies; family members who required proof of death for reasons including demonstrating that children were orphans or to affirm that a person had been widowed and so could remarry; and personal testimonies of witnesses.

3.2.1 Postwar Investigations of Nationalist Victims

With the Nationalist victory of the Civil War, there were obviously great political interest and purpose in investigating war-time crimes committed by Republicans. In 1940, the Francoists started a massive-scale and detailed investigation of the so-called “terror rojo” (“red terror”, making reference to the Soviet Union support of the Republic), that was known as the Causa General. Investigators visited towns across the country to document crimes allegedly committed by Republicans from February 1936 until the end of the war. Evidence collected included witness interviews, post-mortem photographs of victims and victim grave excavations. The Causa General documented different alleged crimes, accentuating and exaggerating the number of victims of those killed by supporters of the Republic and creating a narrative of a single offender (the Republic) against innocent civilians (Badcock 2005:69; Espinosa 2006:95-97; Graham 2005:133; Richards 2007).

After their victory, the Nationalists exhumed the bodies of their fallen members that had been buried in mass graves. The remains exhumed were taken to family burial plots or to the Valley of the Fallen and their names were honoured in the places of
worship of their towns (Encarnación 2008; Ferrándiz 2009:381; Tremlett 2006:34). A recent government census of the monument revealed that of the 33,833 persons entombed, only 21,423 are identified (Junquera 2010a).

Many of the plaques with names can still be seen on church walls today in Spain although the Law of Historical Memory (2007, technically *Ley 52-2007*) has ordered that they be taken down. The monumental Valley of the Fallen, it should be noted, was built by 6,000-7,000 (often political) prisoners of the post-war Nationalist government under conditions that caused the death of many prisoners (Moreno 1999:341, 342).

### 3.2.2 Investigations of Republican civilian victims

In this study the term “Republican victims” refers to those who were killed by the insurgent Nationalists and their supporters. It is important to note that victims of Nationalist killings were targeted largely because they were *perceived* as enemies for supporting the Republic, whether it were true or not, or for simply failing to support the Nationalist rebellion. For this reason, the label of “Republican” is in many cases a misnomer but used here to generalize rather than specifically characterize victim alliance, political or group affiliation. The label better typifies how they were perceived by the Nationalists (i.e., the criteria for which they were targeted, which is important to this study) rather than their actual identity.

Prior to Franco’s death in 1975, unbiased and apolitical investigations of victims of Nationalist violence were not possible in Spain (Casanova 2002:3-50; Richards 2007). A recent study by Herreros and Criado (2009) demonstrates that data on civilian victims of violence are less available for those killed by the Nationalists than those killed by
Republicans. This is probably true for two primary reasons: 1. The exhaustive study of
victims conducted by the Franco regime (the *Causa General*) that took place relatively
soon after the war, had access to more witnesses given that contemporary investigations
are taking place decades after the end of the war; 2. Those regions that the Nationalists
controlled from the start of the coup and throughout the civil war may have a more
entrenched cultural system that sympathizes with the Nationalist cause and so has
frustrated modern investigations of Republican victims (through, for example, the
conservative national political party *Partido Popular*, or PP). This latter point is
exemplified by the refusal of autonomous communities that are governed by the PP to
contribute to the national government’s mapping of mass gravesites as mandated in the
Law of Historic Memory (Casqueiro and Aizpelolea 2010).

Despite the many challenges, the will of those seeking missing family and
community members has inspired an investigative process that is supported by
volunteers, interested academics and, to a far less extent, sympathetic politicians. There
are three main sources of evidence that are being used to investigate killings and
clandestine burials: archives; oral testimony; and grave excavation.

3.2.2.1 Archives

The question of documentary evidence of killings during and after the Civil War
has received much attention by Spanish historians both during and since the end of the
Franco regime. Many problems with relying on such evidence have been identified,
mainly: completeness, accessibility, and accuracy/reliability.
Almost no documentation exists of the less formalized killings, the *paseos* that were the norm in the early months of the war and on which this study is focused. In only some instances where victims were buried in cemeteries, sparse details such as a date of body discovery and the sex of the victim may have been recorded (Espinosa 2006:10, 136-140; Reig Tapia 2006:522; Riloña Pérez 2001:165; Thomas 2003:253). For the formal, legalized repression (generally post 1937) there is some documentation (e.g., prison execution records), although much of this has also been destroyed, particularly the files of provincial prisons and of the Falange (Espinosa 2006:5, 6, 318; Reig Tapia 1979; Ruiz 2009; Thomas 2003:253). Preston (2006) called the destruction of documents systematic and coordinated (p. viii), which implicates the Franco government in the original killings. Given this, Espinosa calls the Franco regime: “kidnappers of the past, the masters of historic memory” (2006:5). In 1985 a socialist government passed the “Archives Law”, designed to protect official documentation but by this time much had already been destroyed in anticipation of the fall of the Franco government and transition to democratic governance (Espinosa 2006:5; Ruiz 2009).

Expectations of comprehensive records would be unrealistic given restricted resources during the times of the killings, the sensitive, informal and generally illegal nature and scale of the killings as well as the fact that there were two opposing governments in Spain at war with each other. Moreno Gómez (in Esposito 2008) estimates that only a maximum of one third of the victims killed by Nationalists are recorded in official registers. Reig Tapia (1979) puts it this way: “Not even the Germans, with their famous obsession for detail and efficiency, had complete records of all the enemies they shot nor of all the persons who died in their concentration camps” (p. 103).
In the few cases where official records of killings actually exist, access has been very limited and tightly controlled. Credible investigations of killings during the Spanish Civil, based in much part on access to remaining archives, only developed significantly in the 1980s and 1990s (Chaves Palacios 2004). Even into the 1990s, though, many archives related to the civil war and Franco regime were officially inaccessible (Tremlett 2006:34). For those archives that are, in theory, available to the public the absence of a centralized archive, governmental apathy and lack of a legal norm giving the right of free access are major impediments to research (Gómez and Junquera 2008:3). Espinosa notes that access to data for only two of 50 Spanish provinces is possible at the National Historic Archive (2006:6). In 2006 Amnesty International publicly criticized the Spanish government for impeding access to archives on the civil war and repression (Amnistía Internacional 2006).

Another major problem with the official documents that exist on those killed by the Nationalists is their reliability and accuracy. The politically sensitive nature of the killings – generally of civilians – resulted in a “cover-up” by the authorities via omission to record, as noted above, or through falsehood. The causes of death officially recorded for many shooting deaths were natural causes such as heart attack, apoplexy, myocarditis or cardiac paralysis (Jackson 1965:534; Oblanca and Serrano 1987:86; Vilaplana 1977). In other cases, causes of death cited were vague such as: “confrontation with the public authorities”, “cranial trauma”, or “firearm injuries” (Armengou and Belis 2004:40; Oblanca and Serrano 1987:86). Espinosa (2006) demonstrates that even when documentation from the Franco era exists, the reliability and accuracy are questionable due to the efforts made by the regime to hide their crimes.
3.2.2.2 Oral Testimony

In the absence or unreliability of official documentation of the killings, del Río Sánchez (2008:3) notes that oral history is the most useful, and most used tool for locating graves and identifying victims from the Spanish Civil War. While oral testimony may play an important role in both police and archaeological investigation, it suffers significant limitations, particularly as the time between an event and testimony increases (Areh and Umek 2004; Mason 2006).

I have personally experienced the inaccuracies and contradictions of oral testimony related to victims of enforced disappearance and clandestine graves in various countries, including Spain. An elderly man, who was five years old at the time of the killing and burial of five civilians near Villanueva de la Vera pointed out a spot on the ground, making reference to three existing landmarks that continued in the place, where he claims to have seen the men buried. Careful and controlled excavation of a large area all around this spot revealed no subsurface disturbance (Congram et al. 2009). Witnesses of Spanish Civil War killings are at least 71 years old and one must expect witnesses to have been at least four or five years of age to remember any details of the traumatic events, thus making the youngest of witnesses at least 75. Add to this consideration the fact that the Nationalists won the war and discussion of crimes against their victims was generally taboo. Reticence or fear of speaking about the killings prevailed for decades and continues even today, preventing transmission of details of killings (Congram and Fernández 2010; Ferrándiz 2008; Sevillano Calero 2004). Thus, witness testimony is generally coming from people who were very young at the time of the events, the events
were traumatic, little public discussion was held of the events for decades, and witnesses are now elderly or deceased.

It is surprising, then, that witness testimony has successfully led investigators to some gravesites. Tremlett (2006) quotes the sister of a victim found in a roadside grave at Piedrafita de Babia as saying: “Everybody knew the bodies were here” (p.6). It is important to note, however, that the excavation took place ten years ago (i.e., witnesses were younger then), and that it took investigators several days of excavating with a mechanical digger to find the specific location of the grave. Today, the problems of relying solely on eyewitnesses are exacerbated by the increasing loss of first-hand witnesses. Santiago Macías, vice-president and co-founder of the Association for the Recovery of Historical Memory, notes the urgency of video recording witness testimony as a make-shift solution before they die of old age (Silva and Macías 2003:252).

3.2.2.3 Grave excavations

The recent exhumation of civilian victims of Nationalist violence has taken place in a sort of legal vacuum – they have officially been neither archaeological nor forensic – and the work is not clearly the strict domain of any particular discipline. Decades after the war, following Franco’s death, and during a transition to a democratic system of governance in Spain, the first grave excavations of victims of Nationalist violence took place. These exhumations were led and conducted by families of the victims, without legal mandates or support (Baviano 1980; Ferrándiz 2009:382, 383; Herrero Balsa and Hernández García 1984), and professional archaeologists and anthropologists did not participate.
In 1979 and 1980 there were many mass graves excavated by families but an attempted coup in February of 1981 ended these exhumations for fear of further disturbing the fragile political and social state that existed in Spain (Encarnación 2008; Silva and Macías 2003). These earliest exhumations, however, appear to have triggered more serious Spanish interest in the victims among local and academic historians (e.g., Herrero Balsa and Hernández García 1984; Reig Tapia 1979, 1986). In 1999, Juliá edited the important work *Víctimas de la guerra civil* (Victims of the Civil War), analyzing the Civil War violence on both sides and also addressing the importance of the socio-political context of the violence (Richards 2007, also see Ruiz 2009).

One year after Juliá’s book was released, journalist Emilio Silva sought and located the unmarked roadside grave where his grandfather had lain for 65 years along with 12 other civilians. A local archaeologist volunteered to lead the grave excavation and exhumations. This single mass grave excavation served as an example and inspired other families of victims to undertake the exhumation of over 4,000 Republican victims from similar graves in seven years (Gómez and Junquera 2008; Silva and Macías 2003). Up to 110,000 more victims of Nationalist repression remain to be discovered (Garzón 2008). In a 2006 interview, forensic pathologist and anthropologist Dr. Francisco Etxeberriá, Professor of Forensic Medicine and leader of a Basque exhumation team, critically pointed out that remarkably few professionals with government agencies and universities have involved themselves with investigations of disappeared persons from the Spanish Civil War (Leizaola 2006:44; also Etxeberriá in Junquera 2010d; González-Ruibal 2007). The experience of this author has shown that Civil War grave excavations

---

6 For a concise review of investigations of civil war repression by historians see Ruiz 2009.
in Spain rely principally on unpaid victim family and community members to conduct background investigations, organize grave prospections and assist volunteer students of anthropology and archaeology with excavations.

Despite the excellent intentions of those who have donated their time and efforts to locate missing persons, careful background research, professional excavations and documentation of exhumations are necessary. As noted by the family member of a disappeared person: “If we begin to disinter cadavers, but without recovering their memory, without creating an archive of the repression; if we only bring in an excavator and an archaeologist and just remove the bones, we will be doing it incorrectly: this person will disappear a second time” (José Antonio Landera in Armengou and Belis 2004:219).

Since 2000, investigators of missing persons from the Spanish Civil War have been almost exclusively those in the civil sector working with victim families, whereas local or regional governments generally have opposed or simply not interfered with exhumations. The exception to this is the Basque government, which has actively supported a team of professionals, led by archaeologists and anthropologists (see Congram and Fernández 2010).

Although there are hundreds of organizations in Spain researching or advocating causes dedicated to the deceased and living victims of Nationalist violence, the Association for the Recovery of Historical Memory (ARMH), through its regional branches has led the majority of grave excavations and exhumations. Another NGO, the Federación estatal de foros por la memoria, (Federation of Fora for Historical Memory, also known as Foro por la Memoria, or simply el Foro, www.foroporlamemoria.info/)
has, since 2002, advocated the state-led investigation of Republican victims and strict crime-scene protocols for grave excavations and exhumations (e.g., Barragan and Fernández 2008; Foro por la Memoria and Conde 2008). The Foro is more overtly “leftist” than other organizations and is associated with the Communist Party of Spain (Barragan and Fernández 2008; Ferrándiz 2006). El Foro even advocates that reburial of exhumed victims not occur in a Catholic cemetery due to the Church’s support of the coup and Nationalist government (Pedreño Gómez pers. comm. 2009). A table of grave excavations and exhumations of Republican victims is in Appendix A.

The election of a socialist national government in Spain in 2004 (and re-elected in 2008) has worked in favour of those investigating missing persons from the Civil War. Despite some local or regional governments that refuse to allow exhumations or threaten sanctions against those who conduct them (e.g., García Calero 2009; Junquera 2009), support from the national government has been increasing slowly. Since 2006, funding supplied for exhumations has ranged from 870,000 Euros (2007) to 1.6 million Euros (2009) and the Spanish senate recently approved a further rise to 2 million Euros for the year 2010 (Barcala 2009). With various groups competing for funding and up to tens of thousands of graves to excavate, however, this support is grossly inadequate, especially considering this funding includes DNA-based identifications.

3.2.3 Legal context

This study examines human rights violations, principally enforced disappearance, and develops methods that assist with their investigation. For this reason, I have included some commentary on legal aspects and context related to the crimes and investigations, with a particular focus on the Spanish Civil War. For a focused review of national and
international legal aspects of investigations, the reader is referred to Zapico Barbeito (2010).

There are several legal conventions and laws that provide a framework for the analysis of behaviour in war time, and specifically the crime of killing civilians and prisoners. In order to best understand the significance and potential consequences of the actions of killers, we must consider the context of the time of the events (Richards 2007), and particularly the legal framework, which has evolved significantly since the Civil War.

The Hague Conventions of 1899 and 1907 established rules relative to the laws and customs of war. Specifically, Article 4 of Chapter II of the Annex to the Hague Convention of 1907 mandates humane treatment of prisoners of war and Article 19 states that prisoners of war shall be treated equally to those of the National Army (i.e., the army that has detained the prisoner) with respect to burial, rules regarding death certificates and wills (Hague Convention 1907; see also Zapico Barbeito 2010:246, fn 13). Along with the Hague Conventions, the Third Geneva Convention relative to the Treatment of Prisoners of War (1929) defined prisoners-of-war and outlined their protection, specifically barring prisoner execution. Spain was a signatory to the conventions, indicating its support of them, but had not ratified them by the time of the Spanish Civil War. Nonetheless, the Conventions had become recognized as ‘Customary Law’, which carries an obligation to respect them (Fernández pers. comm. 2009).

During the Spanish Civil War, the International Red Cross worked with both the Nationalists and Republicans to have them recognize the conventions in their treatment of prisoners, though the conventions did not specifically apply to civil wars (Jackson
The Basques earned an excellent reputation for safe-guarding prisoners from reactionaries – who would have preferred to kill the prisoners outright as was done in much of Spain – and agreed to participate in prisoner exchanges. Their attitude contrasted with other divisions of the somewhat anarchic Republican government and especially the Nationalists, the latter of whom often considered the prisoners they held to be worth far less than their compatriots held by the Republicans (Beevor 2006:225; Junod 1951:98; Thomas 2003:481, 482, 498).

At the end of the war, in 1939, Franco passed a law retroactive to 1934 to punish those responsible for political “crimes”. Among the acts listed as crimes were rebellion, which was to be understood as opposing (actively or passively) the military coup d’état and Nationalist forces throughout and following the war (Beevor 2006:385; Tremlett 2006:34). This law criminalized those who failed to support the Nationalist rebellion and enabled a political purge by making the Republican government responsible for the war (Álvaro Dueñas 2009:53-126). Under this law, the executed and clandestinely buried victims of Nationalist violence had received their due and no investigation of their deaths would be either necessary or possible.

Following Franco’s death, Law 46/1977, the so-called Amnesty Law, was passed (Barragan and Fernández 2008; Davis 2005). This law carried with it a deliberate, but largely tacit, agreement to “forget” the traumatic events of the war and the dictatorship (Davis 2005:863). This political policy of forgetting inspired the deliberate destruction of thousands of documents related to the Franco regime and a large portion of the population went along with the idea that "one has to look to the future and not be tied to the past" (Espinosa 2006 :175-177, also Encarnación 2008). Creating an environment of
enforced forgetting eliminated opportunity to question historical events, particularly the execution of tens of thousands of innocent people.

In 1998, Spanish judge Baltasar Garzón sought the extradition from the UK of former Chilean dictator Augusto Pinochet to Spain for trial on crimes committed by his military government between 1973 and 1990. The extradition request was denied by the British but the apparent hypocrisy in the willingness of the Spanish government and judiciary to pursue Pinochet for crimes committed in Chile compared to their unwillingness to do the same for crimes committed in Spain triggered a strong movement to seek justice for Republican victims (Davis 2005; Encarnación 2008).

In 2002, the United Nations Working Group on Enforced or Involuntary Disappearances included Spain in its list of countries that held the responsibility of resolving cases of disappeared persons. The Working Group, however, observed that it was only competent to consider cases that occurred after 1945 (the year of the creation of the United Nations), which excludes all of the Nationalist killings of civilians during and soon after the war (Commission on Human Rights 2003; Silva and Macías 2003:70-79). The same year, on the anniversary of Franco’s death a motion was approved by Spanish parliament allowing for local and regional authorities to fund exhumations but not at the risk of “re-opening old wounds” (Tremlett 2006:37). According to Gómez and Junquera (2008) the number of those exhumed increased dramatically: 38 in 2002; 279 in 2003; and 216 in 2004. However, exhumations continued to be conducted by nongovernmental organizations and the increase is almost certainly due more to greater private interest and effort rather than active or passive government action.
The Socialist government that was elected in 2004 established an Inter-ministerial Commission to recommend compensatory measures to the victims of political repression during the Civil War and Franco regime (Barragan and Fernandez 2008; Boyd 2008). This eventually led to Law 52 of 2007, the “Law of Historic Memory”. Among other things the law condemns the Franco regime, provides for greater economic restitution to the families of certain victims and it transferred the question of mass grave excavations to the cultural heritage administration from the legal administration (Ballbé and Steadman 2008). The law, however, failed to resolve ambiguity about the domain and legal status of graves as well as who holds responsibility for their investigation, as the Ministry of Justice is in charge of adjudicating indemnities for abuse, torture and murder related to the Civil War and post-war dictatorship (Ballbé and Steadman 2008; Encarnación 2008). Zapico Barbeito (2010) asserts that rather than enforcing existing national and international law that obliges the state to investigate, the Law of Historic Memory merely encourages state bodies to facilitate the investigations as led by the families of the victims.

In 2008, less than a year after the passage of the Law of Historic Memory, Judge Garzón changed how Spain and the legal world would think about and treat the subject of the victims of the Nationalist repression. He filed an Auto, or legal proceeding, to investigate crimes against humanity for actions committed by Franco and 44 other leaders of the 1936 coup d’état and subsequent dictatorship. In the Auto Garzón alleged that there was a systematic plan to exterminate the political opponents of the coupists and Franco regime. As part of the investigation, he alleged there were 114,000 victims and he proposed to oversee the investigation of 19 burial sites, including the removal of remains.
of Republican victims from the Valley of the Fallen (Díez 2008, Europa Press 2008). Several expert advisors were named as well as “stand-in” advisors (suplentes), including the author of the current study (Junquera, 2008).

State prosecutors challenged the case on the grounds that the crimes date to more than 70 years ago, the 45 accused are deceased and that the 1977 Amnesty Law absolves those deemed responsible. The judiciary (Audiencia Nacional) and Supreme Court both eventually declared the case beyond the professional purview of Garzón and he dropped the case, though making the statement that regional courts were competent to investigate the charges and oversee grave excavations (Burnett 2008; Yoldi 2008).

The possibility of government-led criminal investigations deteriorated even further when on the 26th of May, 2009 Garzón was charged with prevarication (intentionally issuing an unjust judgment or ruling), a charge initiated by ultra right-wing groups: Manos Limpias, (Clean Hands, an explicit reference to the non-culpability of the Franco regime), Libertad e Identidad (Liberty and Identity), and the Falange Española de las JONS (International Commission of Jurists 2009; Lázaro 2010). The International Commission of Jurists responded, calling for an end to the prosecution of Garzón, saying that it constituted “an inappropriate and unwarranted interference with the independence of the judicial process, contrary to Article 14 of the International Covenant on Civil and Political Rights, as well as Principles 4, 17, and 18 of the UN Basic Principles on the Independence of the Judiciary” (2009). The ICJ went on to explain that Garzón’s investigation of crimes against humanity was both valid and a duty under international law and that the Spanish Amnesty Law of 1977 has no bearing on the ability and obligation to investigate.
At the time of writing, the case against Garzón was still being considered by the Supreme Court of Spain. The decision to bring the charge against Garzón to trial in April 2010 triggered a day of protest of between 60,000 and 100,000 people in 21 Spanish and six foreign cities (Junquera 2010c; see figures 3.1, 3.2, and 3.3). Garzón was suspended from his duties during the trial and on May 26, 2010 and the United Nations Working Group on Enforced or Involuntary Disappearances issued a press release expressing concern about the case and highlighting the illegitimacy of Amnesty Laws as well as the obligation of States to investigate, prosecute and punish those responsible for disappearances (UNOG 2010).

Figure 3.1 People in Madrid protesting the prevarication trial against Judge Baltasar Garzón for his attempted investigation of crimes against humanity by the Franco regime leadership. Photo: AFP 2010.
Figure 3.2  The son of a man who was executed, protesting the prevarication trial of Judge Baltasar Garzón. Photo: EFE/Alberto Morante.

Figure 3.3  In general, the Spanish government has failed to fulfill its obligation to investigate the fate of victims of enforced disappearance from the Spanish Civil War era, inspiring political cartoons such as this one.
At the end of April, 2010, the Ministry of Justice had nearly completed a map of almost 1,800 mass burials of victims from the Spanish Civil War as was mandated by the Law of Historic Memory. The number is due to increase as two autonomous communities (Andalusia and Catalunya) have yet to complete their analysis. Furthermore, the number only represents the graves in the autonomous communities that are not governed by the conservative political party Partido Popular (nine of 17), which has refused to cooperate with the project. Although geographic coordinates are known, these will not be available to the public as some of the sites lie on private property (Casqueiro and Aizpeolea 2010).

3.3 Conclusion

About 114,000 non-combatants were killed and buried in unmarked graves by the Nationalist rearguard during and following the Spanish Civil War. Much uncertainty remains about the legal and political responsibilities of different levels of government with respect to investigation of these crimes. Franco regime narratives about Civil War offenders and victims persist, frustrating investigations of those killed by Franco’s Army and paramilitary forces.

There is debate in the forensic literature about the responsibility and accountability of forensic scientists and whether they should work exclusively for government agencies or also assist civil sector investigations when governments fail to, or even investigate alleged government crimes (e.g., Blau and Skinner 2005; Cox et al. 2008:25; Congram and Steadman 2008). In Spain, it is clear that elements of the civil sector have accepted a moral responsibility for investigations and assumed their undertaking regardless of the position of the Spanish government. Some scientists and
academics have assisted victim families and communities in their efforts to locate and identify the missing.
4.0 The Rational Act and Dynamics of Enforced Disappearance

...it is only in the context of explanation and explanatory modelling that archaeologists and managers can hope to make truly successful predictions of the locations and other characteristics of the materials that make up the archaeological record. This is so because the things that determine the locations of the materials that make up the archaeological record are not static, unchanging properties of the environment that can be measured easily from topographic or environmental maps (Ebert and Kohler 1988:158-9).

We ensure the killers’ triumph if we do not struggle to understand their motives and goals (Leyton 2005:34).

In this chapter I will show that paramilitary personnel in the Nationalist rearguard acted rationally and, therefore, predictably in the manner in which they killed and disposed of their civilian victims. This knowledge facilitates the search for graves. This chapter addresses the most significant shortcoming of many archaeological predictive models: explanation of behaviour that results in patterned site locations. Although inductive predictive models do not actively seek to explain behaviour, merely detect patterns of it, their acceptance is limited by their lack of explanatory power. Deductive models seek to address this shortcoming, though the vast majority of published examples of archaeological predictive models are in fact inductive. This chapter discusses research that demonstrates the logical nature of the instrumental (i.e., with a purpose), political violence resulting in enforced disappearances and killings. It is essentially the logic employed by perpetrators that makes their behaviour analyzable, understandable and lends itself to predictive modelling.
This study takes as a theoretical foundation the work of political scientist Stathis Kalyvas (2003, 2006) and social psychologist James Waller (2007). Acts such as crimes against humanity, war crimes and genocide – collectively referred to as atrocity crimes (Scheffer, in Chalk 2005) – shock the human conscience. A common response to this shock that is prevalent in the press and general public is to dismiss such actions as a result of perpetrator psychopathology (Leyton 2005:327-330; Owen 2006), which defies general understanding and therefore makes comprehensive study destined to fail (e.g., Donat 1979:9). Kalyvas and Waller dismiss such explanations and instead deem these killings as logical and rational actions. Waller and Kalyvas adopt a systems approach and examine social dynamics in times of conflict resulting in extraordinary violence.

Oblanca and Serrano (1987:79, 80) are only one example of writers on the Spanish Civil War who describe the Nationalist repression as “incomprehensible”, but then attempt to explain it, typically through the lens of an ideological logic. Rosa (2008:14), in the prologue to a study of Civil War violence by Spanish historian Javier Rodrigo, claims that: “the publications of the last few years... allow us to know with greater certainty how many were killed, how they were killed, where, when, who and by whom. But what remains unanswered, at least in a comprehensive way, is the basic question of every investigation: why”. The work of those investigating victims of enforced disappearance from the Spanish Civil War, however, demonstrates that much of the ‘where’, and ‘how’ remains unknown. Later in the same book, Rodrigo (2008) says that the violence committed by the Nationalist forces in 1936 in Spain combined with the contemporary victim-centered and idealized perspective of their suffering has resulted in a failure to properly understand the violence. He says: “We cannot come to understand it
simply by describing it and adopting the perspective of the victims without trying to
understand the logic of the executioners [my emphasis]... one runs the risk of turning the
past into an abandoned space of stereotypes and myths” (p.76).

This chapter addresses the social context and thinking of killers to predict how
they made their decisions to kill, where they chose to do so and also why. Understanding
of the context, motivations and restraints of the killers forms the basis of the reasoning
behind the deductive predictive model and will be used to explain patterns detected in the
inductive model. The chapter concludes with a set of hypotheses related to the
clandestine killing and disposal of victims that will be tested through the analyses
conducted in this study and as supported by the relevant literature.

The following section discusses Waller’s explanations of “extraordinary evil”. He
demonstrates that mass killings are a tragically common result of crowd psychology
where members of the crowds have adopted and fostered an extreme ideology. In certain
contexts, this ideology results in the rationalization of acts that are perceived as
completely irrational and inexplicable by those outside of that crowd and context. A
discussion of the work of Kalyvas will follow to demonstrate the behavioural dynamic of
people in times of civil war where a polarization occurs, which can lead to mass selective
homicides as demonstrated by the Spanish Civil War rearguard killings. The works of
Waller and Kalyvas lay the foundation to demonstrate the socio-political dynamic and
context in which enforced disappearances and clandestine burials of civilians occurred in
Spain.

This chapter will assess and ultimately substantiate ideas about the logic of
political violence developed by Kalyvas and Waller and demonstrate how their
explanations are supported by similar studies of the Spanish Civil War rearguard repression. Working under the conviction that rearguard killings in civil war can be understood, this study will proceed to demonstrate how one result of such killings – unmarked burials of victims – can be located using predictive modelling via an assessment of site selection decisions made by killers based on their objectives and constraints.

4.1 Social Psychology, Ordinary People and Extraordinary Evil

Social psychology generally takes the individual as a unit of analysis (e.g., a killer), but does so by analyzing the individual’s behaviour and relationships as a member of a group or groups and society at large. Key traits analyzed in social psychology are altruism and aggression (Myers 1993). Regan (2009:87) labels civil wars as “group events” and so asserts that an analysis of group dynamics and identity is important for understanding these wars, and specifically violence inherent to them.

Waller (2003:231), referring to atrocity crimes, says that social psychologists:

operate with the beliefs that dispositional [personality] variables only explain a small portion of the variance in social behaviour and that the greatest insights will come from an analysis of the immediate social context. By and large, we do not think of evil actions as the product of evil dispositions or personalities.

Leyton (2005:7), an anthropologist who has studied serial and mass killers, shares this belief:

Killers are not mere freaks, rather, they can be fully understood as representing the logical extension of many of the central ‘masculine’ themes in their culture – of worldly ambition, of success and failure, and of ‘manly’ avenging violence.
Leyton touches on an important point here that is very applicable to the Spanish Civil War context. Accounts of Spanish cultural values of that time, and even in the present, commonly make reference to dominant themes of *machismo* both in the culture in general and particularly during the war (e.g., Prada Rodríguez 2006:157; Tremlett 2006).

In the context of a civil war, triggered by a rebel military intent on overturning liberal reforms of the Republican government and reinstituting power to traditional forces (e.g., the Catholic Church and military) there was a return to conservative values in the Nationalist zone. Among these traditional values were gender roles that were imposed if not by choice, by violent imposition (e.g., Jackson 1965:305). One example of this is that of the 53-year old Virtudes de la Puente, a female victim of summary execution who was targeted for being a protestant and for bathing indiscreetly in a river (Prado 2009; Silva and Macías 2003:218-219). Further evidence of group dynamics and the role and influence of machismo is evident in the differential roles played by women in the two sides of the conflict: as liberal members of Republican female brigades (e.g., Beevor 2006:107, 108), or as filling Nationalist auxiliary and subordinate roles (e.g., Cenarro 2006; Molinero 1998; Preston 2001). Graham (2005:53, 55), however, asserts that for women in both zones, socially conservative gender norms of the times prevailed and were enforced. She claims that portrayals of women playing unconventional roles in the Republican zone, other than as industrial labour, were idealized for propaganda purposes.

4.1.1 The False Notion of Psychopathic Killers

The most common explanation of crimes resulting in mass killings is psychopathology, but this conclusion is typically mistaken, especially when the crimes...
are politically motivated (Abbott 2001; Kalyvas 2006:32, 33; González Calleja 2003; Rodrigo 2008:80). Society, and the media in particular, often assign uncomplicated labels to those responsible for atrocity crimes as a way of distancing themselves from the killers (Leyton 2005:24-27). Such labels also allow the problems of the perpetrators to be classified as the nearest thing to supernatural as will be generally and readily accepted: crazy. Another common explanation employs the word “evil”. With its supernatural connotations, “evil” is used even by the authors from whom the theoretical basis for this chapter is formed. This type of explanation puts more conventional academic and scientific inquiry at a disadvantage by making it seem inappropriate and inadequate. One can simply shake their head and dismiss the problem of explaining atrocious crimes as paranormal and insurmountable and thus the pursuit of understanding and solution is impossible. There is much evidence, however, to demonstrate that this explanation is insufficient.

Perhaps the best example of the normality of a genocidaire is Adolf Eichmann, the middle-ranking Nazi officer who was responsible for the deportation of Jews to ghettos, concentration camps and ultimately execution during the Second World War. Arendt (1994) reported on the 1961 trial of Eichmann in Israel for crimes against humanity and war crimes. Arendt described how a “normal” person showing no psychological disorder had organized atrocious acts of mass killing under circumstances that favoured and rewarded his behaviour.

Leyton (2005) suggests that psychopathology is likely only a minor and partial explanation of killer actions and he attributes their primary motives to socio-political rebellion. However, Leyton also distinguishes the serial killers from those apparatchiks
who kill on behalf of the state, who kill far greater numbers than serial killers and whose
goal is the normally very reasonable career advancement, as embodied by Eichmann
(p.29). Gibson (1973:72), however, notes that in the Nationalist rearguard in Spain many
members of the so-called “Black Squad” paramilitary execution groups used the squads
as an “opportunity for working off long-standing grudges against society”. Gibson shows
a major parallel between Leyton’s serial killers and the low-level agents responsible for
mass killing in Spain. Psychologist Carmelia Bruno (2008:385), who studied political
violence in Argentina, also notes a connection calling the actions of torturers and killers:
“a serial killing with a political argument”. Thus, Bruno suggests that even the low-level
killers share the political motivations of their bosses.

Staub (1996) explains such killings as extreme forms of *ordinary* [my emphasis] psychological processes, supporting Waller’s notion that killers should be considered
‘normal’ but those who are operating in an abnormal (e.g., highly conflictual) context, or
“pathological” situation. The classic example comes from Stanley Milgram’s experiments
on obedience to authority at Yale University (Milgram 1963, 1964, 1965). Those who kill
in these contexts are not crazy. Understanding the context in which they are acting, the
killers are sane, understandable and predictable. Rather than claiming that the
perpetrators of genocide are a particular culture of people or those who suffer mental
disease, Waller claims: “They are you and I” (p. 137), which is to say that they are
ordinary, rational, calculating people. The killings by the rebel rearguard of Spain are
described by Rodrigo (2008:83) as: “rational, purposeful, related and with defined
objectives”.

68
4.1.2 Proximate and Ultimate Causes of Mass Murder

The following subsections will reference Waller’s work to explain the context in which various causes combine to facilitate mass murder. These causes demonstrate that given the social environment in which the killers operate, their actions can be considered rational. Citing work in evolutionary psychology, Waller asserts that people commit mass killings as a result of a combination of ultimate and proximate influences. The ultimate influence is aggression and competition that is inherent to human nature. Waller suggests that the long hunter-gatherer past of *Homo sapiens* has resulted in a strong group identification and our aggression and competition often play out at the inter-group level. Our evolutionary past has created the capacity for mass killing and genocide. The proximate causes that together facilitate mass killings are: a particular cultural construction of worldview; a psychological construction of the “other” (i.e., the other group, the focus of aggression and competition); and the social construction of cruelty (2007:137-161).

4.1.2.1 Proximate Cause: Perpetrator Cultural Construction of Worldview

A group’s cultural construction of a certain worldview (values, norms, principles, practices, etc.) can foster aggression and violence against others. The violence committed by the Nationalists in Spain should be understood by considering political events in Spain preceding the war. There were several events that preceded the 1936 elections that undermined public confidence in the military and worked against the political right in Spain. Primary among these was a disastrous military campaign in the Moroccan colony: violent battles that resulted in widespread death on both sides including about 12,000 Spanish soldiers between 1919 and 1923. The military and the Moroccan “campaign” fell
into serious public disfavour (Payne 1967:187, 188). Government instability, however, was answered by a military dictatorship under Miguel Primo de Rivera (1923-1930) and an attempted coup led by General Sanjurjo (1932). A general strike/revolt in the Asturias in 1934 was brutally suppressed by the foreign legion (causing over 1,000 deaths) (Beevor 2006:16-35; Payne 1967; Ranzato 1999:27, 45). When the left-leaning Republican government was elected in 1936, it proceeded to devolve power from the Catholic Church and the army, forcing generals into lesser posts or retirement and creating a public school system with lay teachers (Atholl 1938:58, 59; Payne 1967:314). The reaction of the political right, with the Catholic Church and military hierarchy at their head, was one of affront and they considered the reforms to threaten the very existence of (their conception of) Spain. Thus, a “crusade” was undertaken to “save Spain” from what they would call an invasion of Marxists and atheists (Graham 2005:72-76; Hughey 1981:487; Jensen 2002:155, 167).

Waller identified obedience to authority and social dominance as two of several cultural models (knowledge structures shared by group members) that play a role in the cultural construction of worldview for those responsible for mass killing. Both of these models play key roles in Catholicism and the military. For a group such as the Falange, which had been isolated by its failure to win parliamentary seats in the 1936 elections, an invitation by the rebel Generals to play a leading role in the rebellion would allow them to achieve socio-political power. This power would come at the seemingly small cost of obedience to Nationalist military authorities in the control of the rearguard, which was attained by means of the execution of ideological enemies. The Falange killings would demonstrate the dynamic explained by Waller (2007:184) whereby: “aggression and
violence often function to increase our status and power within a social dominance hierarchy”. As part of these cultural models, Waller identifies the influence of religious belief systems in individuals’ proneness to prejudice. The strong influence of the Catholic Church on the side of the Nationalists almost certainly contributed to such prejudice against the republican victims (atheists, Marxists, socialists, homosexuals, liberals, etc.) (Casanova 1999:64). This can be understood especially well given Spain’s (and the Church’s) historic struggles against other groups including Muslims, Jews and indigenous peoples in the Spanish colonies. Graham (2005:28, 29) supports this cultural model by associating Nationalists killings with a frame of mind that is “historically associated with certain forms of Catholic culture and practice”. Oblanca and Serrano (1987:81) assert that during the Civil War in the province of León, the Church served not only as a legitimizing factor for the repression but certain members sometimes even acted as participants in the physical elimination of republicans.

Jensen (2002:155) clearly states the cultural construction of worldview that would dominate Nationalist thinking and rhetoric and facilitate mass killing in the rearguard:

The rebels’ belief in the righteousness of their cause and their conception of sacrificial death in battle as inherently glorious played more important roles: they shaped an extreme rightist conception of national identity, and they facilitated the interpretation of the rebels’ struggle as a holy war.

This call to serve a ‘higher’ cause in the Nationalist worldview could not be more clearly demonstrated than through the report by Jackson (1965:425) of the instruction to Carlist paramilitary recruits (requetés) that for every “red” they killed they would have one year less in purgatory.
4.1.2.2 Proximate Cause: Social Construction of Cruelty

A further concept developed by Waller to explain extreme violence is a “socialization of cruelty” in a “context of cruelty” (p. 234, 243). According to Waller there are two mechanisms that may lead to extreme violence by reinforcing in-group solidarity and out-group competition: repression of individual conscience and rational self-interest (p. 244). When a nation is divided in war, perceived personal insecurity rises dramatically, resulting in the formation of often polarized, competitive groups. In cases where people choose not to join a group, motives may be questioned by others, suggesting that rather than being neutral the person is actually against the group they did not join. Thomas (2003:273) cites Falange posters as announcing that: “There is no middle course. With us or against us?” General Mola’s instructions for the uprising likewise included: “He who is not with us is against us” (Beevor 2006:56), employing what Graham (2005:32) cites as a “brutal political binary”. Most of the Nationalist rearguard killings in Spain were committed against those who were formal members of groups considered to be enemies: Republican and liberal politicians, union members, lay teachers. Other victims, however, needed only be labelled as loosely associated with such groups (e.g., Manuel Merino Blanco, the owner of a bar reportedly frequented by “leftists” who was killed and buried in a mass grave in Covarrubias, Burgos, [testimony of a family member of the victim, Covarrubias case file, Sociedad de Ciencias Aranzadi]).

With an increase in killings, the stake that the killers have in their group’s success increases, which enforces group membership. Binding factors of the group (Waller 2002:259) are thus increased at the cost of autonomous agency that might go against
group objectives or actions. The association with a group involved in killings brings on a level of responsibility and commitment. In maintaining membership, and especially in the commission of killings, one’s desire or need to see that group succeed becomes far greater to justify such actions and avoid future judgement should the group fail to achieve and maintain power.

a) The Use of Euphemisms

A factor that facilitates the construction of a context of cruelty is the employment of euphemisms or camouflage vocabulary with respect to victim groups and violent actions (Waller 2002:244). The purpose of using such language is to disengage killers from their consciences (p.243-247). The most widely known example of this is Nazi Germany’s genocide of the Jews being termed as “resettlement, removal, or special action” (Dutton et al. 2005). In Cambodia in the 1970s Khmer Rouge enemies were considered to be “contaminated” by foreign influence (Kiernan 2008:9) and instructions to kill were given as: “sweep, sweep out, and discard” (Power 2002:129). Kiernan (2008:56, 57) records the prevalent use of euphemisms as the Pol Pot regime in Cambodia went through a vigorous process of “screening” people, to “uproot spies root and branch”, ensuring that the post-purge population would be “pure”. In Rwanda, killers were “doing the work” (Dufka, in Musselman 1999). Other common examples used recently by the media and authorities in NATO countries include the use of such phrases as “collateral damage” and “friendly fire” (Ghosray 2008; Thorne 2008). In the former Yugoslavia the term “ethnic cleansing” became ubiquitous (Power 2002:249; Silber and Little 1996:171, 306-307). Waller makes a point of admonishing the use of the term “ethnic cleansing” by contemporaries for its blatant downplaying of atrocious crimes.
During the Spanish Civil War Nationalist terms included the *limpieza*, or “cleansing” of Spain and the need for a cure for the *enfermedad* (sickness) that was the Republican government (Amengou and Belis 2003:31; Beevor 2006:88; Rodrigo 2008:63; Vega Sombria 2005:73, 74). As Beevor (2005:425) describes it, in the minds of the Nationalists “Foreign contagions and cancers had to be cut out” (also Rodrigo 2008:83). Fontecha (1988:374) reports locals in Navarra referring to episodes of enforced disappearances as “excursions”. Gibson (1973:110) reports that: “Give him coffee”, was Nationalist General Queipo de Llano’s “favourite euphemism when ordering an execution”. Also according to Gibson, the cause of death given in official cemetery records in Granada for those executed was “killed by detonation of firearm” (p. 77). More specific terms related to the actual killings in Spain are *paseo* and *saca* (see Chapter 3 for definitions). Smeulers (1996:31) contends that although the use of such euphemisms may be a conscious effort on the part of the killers to obscure the reality of the killings to outsiders, “it is at least as important as a psychologically more comforting reality for the perpetrators themselves” (also Dyer 2005:8).

In Burgos province, prisoners were said to have been “transferred to Pamplona”, another way of saying that they were taken out and executed (Rilova Pérez 2001:166; Zavala 2006:295). The psychological needs of the killers to euphemize demonstrate knowledge of the wrongness of their actions. This in turn helps us understand why an element of discretion and clandestine action were employed in the killing of their victims despite having the explicit instruction or at least tacit approval of the governing military authorities.
b) De-individuation

Waller cites various authors including LeBon (1895), Freud (1921) and M. Scott Peck (1983) to support the importance of groups and their influence over individuals with respect to violent acts. In the context of a group individuals may change how they think: losing individual conscience with decreased individual autonomy and increasing altruism through what Waller calls “de-individuation” (p.252). In this environment, violence committed by a group member becomes more easily justified.

In the Nationalist rearguard of the Spanish Civil War, group membership in the paramilitary Falange grew tremendously in the first few months of the war (Casas de la Vega 1974:39; Jackson 1965:418). Given their lack of military training, the Falange were responsible for working with the local rebel police to “maintain order” in conquered territory, rather than fighting at the front (Casas de la Vega 1974:126, 127, 132; Payne 1961:142-147; González Cuevas 2000:142). The organization and actions of Falange members give support to a social explanation with respect to civilian killings. Anonymity via group membership is evidenced through the adoption by members of uniforms (dark blue shirts), the Nationalist salute (equivalent to that of the Nazis), and identification with foreign fascists in Italy and Nazi Germany (Brenan 1960:308-311; González Cuevas 2000:128; Moreno Gómez 2008; Thomas 2003:247; Vilaplana 1977:138; Whitaker 1942:109). Altruism is evidenced in no greater form than the well documented, oxymoronic Foreign Legion motto, adopted by many Falange: “Viva la muerte” [long live death] (Thomas 2003:486 ; González Cuevas 2000:129) and their battle anthem, Cara al Sol [Face to the Sun], which people were forced to sing on command and later at schools during the postwar era (Iniesta López 2006; radiocable.com 2009). The anthem was written and first performed in 1936, the year of the coup that started the civil war,
and includes phrases consistent with the themes of machismo and altruism, speaking of battalions and conquering, about answering the call of death, dying in one’s new [blue, Falangist] shirt, about ascending into heaven to stand guard alongside fallen companions and about victory in war (despite the fact that the war had not yet formally begun).

Beevor (2005:425) states that “the cult of virility and death went hand in hand as the imagery of... the Falange” and González Cuevas (2000:129) claims the Falange as being dominated by “pathos of sacrifice and of death”. Macho themes are also evident in the slogan stating that those who did not wear a Falange uniform (i.e., were not prepared to join their group and die for it) should wear a skirt (Thomas 2003:247).

Besides group membership, other factors contributed to an individual’s reduction of responsibility and conscience for rearguard killings in Spain. The fact that the overwhelming majority of their victims were civilians (and all of those used for this study) can explain the perceived need for discretion when killing. Many authors and the data used in this study suggest that the killings almost always occurred at night (e.g., Jackson 1965:297; Martín Barrio et al. 1988:398; Thomas 2003:250). This suggests either a formal mandated policy or group logic was responsible for the time of day at which killings took place, but both can reasonably be assumed to have been driven by a sense of socio-political sensitivity over the executions. Waller cites killing at night as an example of de-individuation by helping anonymize the killer (p.252). In Spain, despite the virtual impunity of the Falange and the fact that the general populace knew that the victims had been in the custody of the authorities and often knew the killers personally, there seems to have been a desire to avoid public executions.
4.1.2.3. Proximate Cause: Psychological Construction of “Other”

An important aspect of group identification and thinking as analyzed by Waller is the social construction of targeted groups and individuals perceived as a threat; a phenomenon Waller calls the psychological construction of “other”. There is much evidence of the psychological construction of out-groups in conflict in the form of labels. In Rwanda, Hutus were publicly referred to as ‘cockroaches’ (Melvern 2004:9; UN Lessons from Rwanda [online]), thereby associating them with something inhuman and that evokes disgust. During the Vietnam War, the American GIs called their enemies “gooks” (Boyle 1972:49). The former Yugoslavia provides a good example whereby decades of communist governance actively minimized the importance of group (e.g., ethnic, religious) difference (Silber and Little 1996:29). At the outbreak of the wars, previously unlabelled, non group-identifying Yugoslavs came to strongly self-identify and be identified by outside groups as Orthodox Serbs (referred to by their enemies as “Chetniks”); Catholic Croats (“Ustashe”, or “fascists”, all references to WWII identities – in Croatia’s case to Nazi collaborators); and Muslim “fundamentalist” Bosniaks (Ignatieff 1997:187; Silber and Little 1996:86, 142; Ron 2002:296). Ignatieff (1998:34-71), having reported on modern conflicts though particularly those in the former Yugoslavia astutely coined the exacerbated group differences that are constructed in conflict the “narcissism of minor difference”.

Spanish Nationalists used exaggerated and generalized labels to portray those loyal to the government (at most) or those not actively supporting the coup: ateos (atheists, as the Republic had been diminishing the power and influence previously enjoyed by the Catholic Church), rojos (reds), Moscovites Marxist hordes (references to
Soviet support for the Republic and Communist Party influence in the Republican government), savage and blood hordes, etc. (Sevillano Calero 2004:36, Reig Tapia 2006:530; Whitaker 1942:109), to name a few. From his interviews of Nationalist military officers, Jackson (1965:536) reports the sentiments as such: “The officers treated the matter as though it were a question of exterminating vermin... They weren’t killing men; they were cleaning out rats”. Thomas (2003:253) reports that the culmination of Nationalist propaganda was the rebel view of their opponents as “worthless”. Vilaplana (1977) noted that in Burgos the number of citizens regularly attending Catholic mass increased dramatically following the first wave of targeted civilian executions by Nationalist forces, demonstrating the natural reaction of people to seek protection via identification with a group (the Catholic Church). Gibson (1973:104, footnote) also reports peoples’ fears of not being thought of as good Catholics following the coup in Granada, in the south of the country. Other rhetoric employed by the Nationalists demonstrates the rhetoric in a tangential way, as with their claim to be staging the coup to “Save Spain” (i.e., save it from the enemy that threatens to destroy the country in the form of a liberal republic). Even the groups of paramilitary killers took on less-than-specific but easily interpretable names: “Black Squads”; “Black Shirts”; “Black Dragons” (Gibson 1973:72, 72; Pons Prades 2006:27; Preston 1986:55). The use of these labels not only reinforce group difference, but also emphasize different worth between the two sides of the conflict and help facilitate a context of cruelty, as described in the subsection above.
4.1.3 Summary of Waller’s Thesis

Waller’s work tells us that the context of the Spanish Civil War, and specifically that of the rearguard, is abnormal (pathological) but the actions of those committing atrocious crimes in this context are rational actions. Furthermore, the dynamic of armed conflict creates a context whereby group membership and action play a primary role, thus restricting will and opportunity for autonomous agency. In speaking to a former Nationalist soldier Brenan (1965:145) reports the ex-combatant’s confession in this way: “...there is no use disguising the fact that we lost the use of our reasons”. The influence of the context, conflict and group-thinking resulted in individual behaviour that would not be reasonable in normal times and in some cases, as with this former soldier, there is recognition of the fact. By this confession the man is not suggesting that he went “crazy”, merely that he failed to exercise “normal” discretion as meant by that of a non-pathological context (e.g., peacetime).

The following section will highlight the dynamics of political homicide in civil war. The work of Waller and Kalyvas will then form a basis for understanding the directed killing of civilian victims in the Nationalist rearguard so as to deduce the whereabouts of the victims’ graves.

4.2 Selective Homicidal Violence in Civil War

...mass killing tends to be associated with order rather than disorder as suggested, among others, by the Nazi and Japanese occupations during World War II (Kalyvas 2006:73)

The notion of a pathological context presented by Waller has some support from Kalyvas who says in relation to war time violence that the military: “shapes the social and
economic context, structures politics, defines the relevant political actors and their strategies, and defines individual incentives and behaviour” [my emphasis]... war entails more constraints and less consent... [and] the stakes are incomparably higher for everyone involved (2006:38). In this section, work by Kalyvas (2003, 2006) is used to show the reasons for and dynamics and mechanisms of violence in civil war. Specifically, he analyzes the targeted killing of civilians by contending authorities with the objective of obtaining popular compliance. This section will explain the decisions and actions of paramilitary assassins against civilians through a consideration of the objectives, mechanisms and constraints of the killers. This understanding will then be used towards the effective prediction of locations of unmarked graves of the victims of the Nationalist rearguard repression in Spain.

Selective homicidal violence in civil war revolves around the motivations and constraints of the killers. One of Kalyvas’ key observations is that where a group in a civil war is contending for control, the degree of selective violence they employ is directly related to the level of control they possess. Where control is uncertain, their use of violence may drive the local population to seek defence from the other party in a conflict, what Kalyvas calls the “backfire effect of violence” (p.203). When near complete or total control is held over an area, the use of violence is generally unnecessary. It is when control falls between these two levels, as in the Nationalist rearguard where the Falange hold political and policing responsibility but the war is ongoing, that the authorities selectively target and kill civilians.
4.2.1 Local and Supra-Local Dynamics of Selective Violence

In a 2003 article, Kalyvas focuses on the interplay of actors and issues at the local/private and the major, or “master”, levels as the central points of the conflict. There is a “joint production” of action between the centre and the periphery in the use of violence (see also Campbell 2002:1). The author of the present study accepts this thesis but how it relates to behaviour resulting in semi-clandestine killings must be clarified. Communication and coordination between local and supra-local actors suggests that there will be a degree of continuity with respect to repression and killings. The degree and actualization of repression as mandated from above, however, will be affected by a filter at the level of local actors. A primary consideration for this study is if local actors significantly affect the manner and mechanism of killing, resulting in geographic inconsistencies of kill and burial sites (see sections 5.2.5.1 and 6.2.1 on spatial autocorrelation as this relates to the current study). Concerning the Spanish Civil War rearguard, Armengou and Belis (2004:183), suggest that the reason for killing had no effect on the form: “...it seems that the motive did not matter, the result was the same – a murder and burial in a roadside ditch”.

Despite any potential local differences, Kalyvas (2006) demonstrates strong patterns in the mechanism of violence in civil war relating the observations of anthropologists who have noted “incredible cross-cultural similarities in practices of political violence” (p.9). Kalyvas asserts that within civil wars, despite differences in context, mechanisms of selective violence recur in systematic and predictable ways (2006:7, 10, 12). If international and cross-cultural patterns have been observed, it stands
to reason that intra-national and particularly “intra-Nationalist” (i.e., in Spain) patterns will be even more consistent.

Despite the influence of private grievance and violence in the context of civil war it is constrained by the “modalities of alliance” (Kalyvas 2003:486). It is important in this study to assess the relationship between the local-level killers and the leaders of the Nationalist coup and war. Those responsible for virtually all of the killings in this study are members of the Falange paramilitary, sometimes acting alongside the Civil Guard. The 1936 electoral failure of the Falange threatened their meaningful political existence. In subsequent months, military conspirators negotiated with various groups, particularly the Falange, in order to garner support. Although the Falange could therefore tout the fact that they had been consulted for support and thus held a degree of influence, they also had to recognize that without the support and eventual triumph of the Nationalist authorities they would return to their marginalized position in a democratic, Republican Spanish society. The Falange, therefore, had a direct interest in a Nationalist victory and thus submitted themselves to the authority of the rebel military leaders. Likewise, for the Civil Guard members who had defected to the Nationalists, their careers and, probably, lives depended on a Nationalist victory. For these reasons, local motives with respect to killings would not likely have gone overtly against the desires of the Nationalist military and political authorities. Agency of local killings may have diverged slightly from supra-local objectives and orders but would seldom go against them.

In the late fall and winter of 1936 the Nationalists instituted changes that affected the form of the repression. The changes demonstrate a concern of the leading military authorities that demonstrates Kalyvas’ analysis of local and supra-local actors as they
relate to violence. By late 1936 fronts had become fairly stable between the warring parties and Franco began to consolidate his power (Sevillano Calero 2004:62, 120, 122). The evolution of killings by Nationalist forces seems to have gone through three general phases:

1. An initial, more anarchic stage of large-scale killings by military forces as they moved into new territory. The most notorious examples of these are the large-scale killings at cemeteries in Andalusia (Jackson 1965:299, 300; Zavala 2006:272) and the machine-gunning of 1,000 to 1,500 prisoners in the bullring of Badajoz (Espinosa 2007:371). These killings generally occurred immediately following the conquest of territory and were committed by the advancing troops, partly as a means of protecting the advancing military from having to return to combat continuing resistance in previously conquered territory (Armengou and Belis 2004:37, 38; Jackson 1965:536).

2. Over the first four months following the attempted coup, the predominant form of killing (far exceeding battle casualties, Bahamonde 2005:139; Bennassar 2005:102; Castro 2006:250; Jackson 1965:533) was targeted, more covert executions of civilians by the Nationalist rearguard, mostly by Falange paramilitary. The killings during this phase are characterized by paseos and sacas, whereby people were detained at their homes or taken from prisons at night, driven out of urban areas and shot at road-side locations. Castro (2006:220) reports that these were the predominant forms of killing and in little over two months 26 sacas produced at least 400 deaths of prisoners from the Burgos Central Prison alone. Castro calculates that paseos and sacas
accounted for at least 75-80% of all deaths in Burgos in the first three months following the coup in Burgos (p. 221).

3. A consolidation and formalization of political and military authority under the generalissimo Francisco Franco took place in the late fall and winter of 1936. Following this, courts martial were imposed and killings were preceded by mass incarceration, group “show trials” lasting only minutes, mass sentencing and formal, “legal”, or legitimized executions (Espinosa 2007:402; Rodrigo 2008). This last phase would become the dominant mode of killing from 1937 and beyond the end of the war and has been referred to as the “institutionalized repression” (Prada Rodríguez 2006:202-295). This repression is said to have been instigated by foreign allies of the Nationalists (presumably the Germans and Italians, Vilaplana 1977:87, 170), probably due to sensitivity of negative press related to the killings (e.g., Martín Barrio et al. 1988:373 in Aróstegui). Given the legitimized nature of the killings, they would more often take place publicly, or at least not in the clandestine form of paseos and sacas of the second phase of the repression (e.g., Torres 2002:247).

The second phase of the repression is what is of interest and relevance to this study as it is when the vast majority of clandestine burials were produced. The killings from both the first and third phases were more likely to result in cemetery burials (e.g., Botella López pers. comm. 2009 on Andalusia; Rilova Perez 2001 on Burgos) and so predictive modelling would be inappropriate as a method of investigation, except possibly to ascertain more probable areas within the small space of cemeteries. Although
killings from the “institutionalized” repression (phase three) often resulted in cemeteries of unmarked graves outside prisons, the scale and formalization (“justification”) of the executions are characterized by burial places that are widely known, even if individual graves are not directly associated with named victims. Many official records exist of phase three killings (e.g., Uclés, Cuenca Province), although access to the documents is limited and their accuracy and completeness are questionable (e.g., Espinosa 2007; Iniesta López 2006; Jackson 1965:534; Reig Tapia 1979:103).

Naturally these phases are not strictly chronological in the sense that more than one type of killing could have been taking place at the same time and at the same place. The change from one phase to another was gradual and organic and obviously depended on factors such as when the Nationalist military arrived at an area, if their forces were able to maintain the area (generally the case), the stability of their authority there and the resources available (the last two of these would determine the ability to impose more formal methods of execution in the form of mass imprisonment and courts martial).

Other authors, such as Rodrigo (2008) also evoke three phases, but refer to them differently as a phase of ‘hot’ terror (my phase two above), followed by state terror via repressive institutions (my phase three above), and finally a post-war purge. The transformation of repression and killings is explained by changes in the degree of authority asserted and hegemony held in Nationalist territory, demonstrating the dynamics of selective violence identified by Kalyvas (2006), as well as the local and supra-local interactions. The transition from phase two to three was instigated by a consolidation of power and resources by Franco in the late fall/winter of 1936. Franco united the paramilitary groups, subjecting them to stricter control, and he created military
tribunals to process the tens of thousands of prisoners that were in Nationalist prisons. *Paseos* and *sacas* declined following these changes but mass executions continued as a result of summary courts martial. Sender Barayon (2003) provides a glimpse of the effect of these changes. He describes how local Falangist authorities panicked upon learning that General Franco was going to visit Zamora because of concern over scale and form of the repression, being characterized by *paseos* and *sacas* of which Sender Barayon’s young mother was a victim in October 1936 (p. 250).

Kalyvas, citing several authors, expresses the transition of rearguard violence based on hegemony in Spain this way:

...most of the violence against civilians during the Spanish Civil War took place in the initial months when high uncertainty and the presence of real or suspected ‘Fifth columnists’ (a term invented during this war) behind one’s back subverted the logic of front lines and generated a sense of acute vulnerability. Once the front line was stabilized, violence [selective homicide] decreased ([Ledesma 2001:256; Ucelay da Cal 1995:84; Ranzato 1994:li], Kalyvas 2006:85).

The degree and type of violence that this near-hegemony inspired thus explains why the vast majority of the cases examined in this study date to the first few months of the Spanish Civil War. After that time (i.e., phase three), killings were generally conducted more formally in the form of a death sentence and the bodies buried “publicly” by the prison. It generally took the Nationalists little time to assert and establish their full authority over the west and north of Spain, in which the cases for this study occur. The location of prison graves from phase three, when hegemony had been accomplished, are often known and so predictive modelling is not necessary to find them.
4.2.2 Denunciations and Death Lists

Selective homicide in civil war is based on victim information available to the killers and the killings develop into what Kalyvas calls a “political economy of denunciation” (2006:192-195). A key feature of this economy is a “death list” of potential victims that is compiled by informers and which demonstrates the different levels of coordination required to facilitate selective homicide in civil war. These death lists identify potential or actual targets as suggested by locals to assist the killers who might be unfamiliar with the local population. There are many examples throughout the Spanish Civil War of the willingness of locals to produce such lists and the reliance of the killers on them (e.g., Armengou and Belis 2004:50; Bennassar 2005:106; Fontecha et al. 1988:398; Gibson 1973:74; Prada Rodríguez 2006:159; Vega Sombria 2005:85; Vilaplana 1977:95-98, 231). Brenan (1960:321, 322) notes the key role of the Falangists and Carlists in this respect as having compiled lists of political enemies prior to the coup. Moreno Gómez (1988:325) called such denunciations “the motor of Francoist justice”. Nevertheless, there are exceptions where local Falangists are responsible for killings in Spain as evidenced in reports used for this research. Possible explanations for such contradictions are discussed in section 7.4.

Kalyvas’ work examines the motivations and constraints of deciding to selectively kill in civil war. Knowing that the killers are acting rationally, a similar analysis of killer objectives and limitations is useful in explaining the dynamics of the killing process, including the places in which victims are killed.
4.2.3 Objectives of Rearguard Killings of Civilians

Two primary objectives of rearguard killers in Spain are apparent: to eliminate perceived and actual opposition and to terrorize others (e.g., Bennassar 2005:107; Sevillano Calero 2004:75). This assessment is supported across a broad spectrum of instrumental paramilitary violence as determined by Kalyvas’ work (2006), accounts of the Spanish Civil War (e.g., Díaz-Balart and Rojas Friend 1997:15) and other studies of paramilitary violence (e.g., Campbell and Brenner 2002). Below is a brief discussion of these two objectives and how their consideration is important when trying to predict clandestine grave locations.

4.2.3.1 Elimination

Much of the language used by the leaders of the Nationalist coup reveals intentions quite clearly in the preparation for and at the earliest stages of the coup. Rodrigo (2008:62, 63) is one of many authors who relate the following quotes as evidence. On the 25th of May, 1936 – almost two months prior to the coup – Spanish General Emilio Mola Vidal, the director and planner of the uprising, declared: “One must take into account that action must be extremely violent to reduce the strong and well organized enemy as early as possible”, and later: “Debate? Never! This war must end with the extermination of the enemies of Spain”. Finally: “One must sow terror. One must leave the sensation of dominance, eliminating with neither scruples nor vacillation all those who do not think like us” (my translation). The rebel general’s intentions of terror and elimination could not be clearer. Franco himself claimed to American journalist Jay Allen, 11 days after the start of the coup, that he would kill half of Spain if

---

7 Castro (2006:212) cites this speech as having taken place on April 25th, 1936, three months prior to the coup.
necessary (p.63). Captain Aguilera, one of Franco’s chief press officers said it this way: “We’ve got to kill and kill and kill... It’s our program, you understand, to exterminate a third of the male population of Spain. That will clean up the country and rid us of the proletariat” (Whitaker 1942:107, 108). Whitaker quotes Captain Aguilera at length claiming that his social and political ideas were “perfectly typical” of those on the Franco side (p. 109).

Armengou and Belis (2004:38) accentuate that the overarching goal of the killings was to eliminate the social base of the Spanish Republic, which would be accomplished by killing one percent of the population. De la Fuente draws comparisons between genocide of indigenous persons in Guatemala in the 1970s and 1980s with that of the Spanish Civil War. Despite the difference in the two countries of a largely ethnic target (Guatemala) and a political/ideological one (Spain), the objectives and results of the killers in both places, he asserts, were the same: destroy the social fabric underlying the group via targeted assassinations (2009 pers. comm.). Moreno Gómez (1988:308) draws the same comparison using the term: “scorched earth policy”, to describe the tactic employed by the Nationalists and a policy borrowed from the Nazis and in keeping with tactics used in colonial wars. Moreno Gómez also adds that elimination of the person was often considered insufficient and that official documentation of their life and death was also destroyed in an effort to further enforce their disappearance (p. 311).

Most authors on the Spanish Civil War repression cite elimination of opposition as the primary objective of the killings (e.g., Castro 2006:212; Herrero and Criado 2009; Prada Rodríguez 2006:157; Reig Tapia 2006:527; Vega Sombria 2005:83), especially as the war was a political one and thus those individuals who represented the enemy politic
were obvious targets (e.g., leftist politicians, unionists, lay teachers). This objective is easily identified and logical given that the overall aim of the Nationalists was to impose a new political regime.

4.2.3.2 Terrorize

Bahamonde, the former propaganda minister for the Nationalists and cousin of Francisco Franco, stated that the only weapon of the Nationalists in their struggle for victory was terror (2005:139). Prada Rodríguez (2006:156) quotes general Mola in Pamplona in June 1936, who demonstrated an objective of the violence: “It is necessary to propagate an atmosphere of terror… Whomever is openly or secretly a defender of the Popular Front must be shot”. Thus, the shootings served a second purpose and not just that of eliminating opposition. As the coup evolved into a civil war, tactics had to change to accommodate a possibly long internal conflict. There were many who were not sympathetic to the Nationalist cause with the announcement of the coup, and gaining their support for the new regime became critical. The primary tactic for this was coercion via threat and the use of violence. In this sense, targeted killings could serve not only the purpose of eliminating the enemy but in terrorizing others into submission (e.g., Herrero Balsa and Hernández García 1984:62). Many authors on the repression cite the decision to leave murdered bodies on the surface as a technique of terror (e.g., Armengou and Belis 2004:37; Beevor 2006:89; Brenan 1960:323 fn1; Jackson 1965:299; Preston 1986:61; Torres 2002:201; Vega Sombria 2005:77, 97). In the words of Thomas (2001:248) the people: “had to be terrified into acquiescence of the new order before the nationalist commanders could sleep peaceably in their beds. Hence, not only did the rebels act with ruthlessness towards their enemies, but they had also to act openly and
expose the bodies of those whom they killed to public gaze. Such public “punishment” is meant to act as a deterrent to others who might consider subscribing to the same politics or pursuits as the freshly executed “criminal”. The same strategy of leaving victim bodies out as a warning to others has been observed in other civil wars (Regan 2009:110), suggesting that the repression in Spain is not unique in form, lending support to the inferred reason behind the practice.

Unburied bodies were not just a tactic, however, as noted by Vilaplana (1977:68) who points out that the lack of ability of any independent person to investigate deaths, simply meant that overt clandestinity or burial was unnecessary (also Thomas 2003:250). Even still, it is clear that a degree of discretion was considered prudent to obscure any evidence of the killings (e.g., Gómez in Esposito 2008). The subsection on political constraints of killings below develops this point further.

Sender Barayon (2003:267) notes the effectiveness of the tactic of targeted killings in Zamora by showing that only a few (6-9) killers could use terror to control the population of 6,000. Before and during the Civil War, Vilaplana was a lawyer employed by the government in the province of Burgos to investigate suspicious deaths. His accounts from during the first months of the war attest to the success of terror as a tactic as demonstrated by the lack of people who would identify victims out of fear of being associated with them (1977:68; also Castro 2006:216). He reports that the effect of the “disappearances” or more obvious targeted assassinations had a cataleptic effect on the population (p. 228, 229; also Reig Tapia 2006:525, 526).
4.2.4 Constraints on Rearguard Killings of Civilians

In assessing the balance struck between the primary objectives of killings (elimination and terrorizing) one must account for the constraints upon those working towards the objectives. If killer behaviour is rational, it is a result of a weighing of objectives and constraints and by understanding the interplay between these, one should be able to reliably predict the results of killer decisions (e.g., locate a victim burial). Of these limiting factors, Kalyvas (2006:38) says that war “entails more constraints and less consent... [and] the stakes are incomparably higher for everyone involved”. In this context one sees how behaviour becomes more predictable if objectives and constraints are properly identified.

Constraints upon those conducting rearguard killings of civilians during the Spanish Civil War are grouped here into five categories: resources (material and personnel); geographic; temporal; psychosocial; and political. These categories are not mutually exclusive. Geographic, material and personnel factors all influence temporal constraints and psychosocial considerations strongly influence political conditions.

Resources. A key point emphasized by Kalyvas that explains consistency in violent behaviour during civil wars in different places is the restriction of resources for control of territory and populations. While regular wars are typically extremely costly, civil wars can be seen as being doubly so as actual and potential national fighting forces turn against each other. Although resources may exist to conquer territory, those required to maintain control over new territory and its population are generally lacking, particularly when the population is divided as to which side to support in the conflict. The challenge for the
military is to establish forces that can control the rearguard while maintaining momentum to continue taking territory. The lack of resources for the maintenance of control in the rearguard, then, is typically obtained via coercive and selective violence. As Kalyvas puts it: “the amount of military resources required for the imposition of full and permanent control in a country town by civil war is enormous and, therefore, typically lacking. This places a premium on the effective use of violence as a key instrument for establishing and maintaining control – and thus for generating collaboration and deterring defection; in turn, effective violence requires discrimination” (2006:11). Limited resources are included in two categories here: material and personnel.

i) Material. Some of the more obvious constraints upon killers include lack of material resources in the form of vehicles to transport victims, fuel\(^8\), detention facilities, and food and drink for detainees. The civil war interrupted normal production within the country and resources to buy from other countries would go first to support the fighting for new territory (i.e., the front lines). Evidence of the restriction of material resources, which Kalyvas wrote as key to understanding civil war violence, can be evidenced by reports of the Falange, not having their own trucks and using those of locals to transport their victims (Cobelli in Gibson 1973:118; Vega Sombria 2005:90). The lack of detention places may even be seen as motivating night time sacas, to provide space for incoming detainees (e.g., Jackson 1974:80). The taking of victims directly from their homes to kill sites may also reflect the lack of

---

\(^8\) In the judgement of General Krstic at the UN tribunal in The Hague, the requisitioning of fuel for vehicles used in the execution of between 6,000 and 8,000 men and boys from Srebrenica served as evidence of his knowledge of the killings and contributed to a conviction of guilt for genocide (ICTY Appeal Chamber Judgement, Case IT-98-33-A, April 19, 2004).
detention facilities.

ii) Personnel. Kalyvas also cites a lack of personnel for maintaining control over an area as critical to understanding the use and form of violence. The killing of 1,000 to 1,500 in Badajoz was cited by Colonel Yagüe, exaggerating the number of those killed, as a problem of lack of personnel to control the rearguard: “Of course, we shot them,” he said. ‘What do you expect? Was I supposed to take 4,000 Reds with me as my column advanced, racing against time? Was I expected to turn them loose in my rear and let them make Badajoz Red again?” (Whitaker 1942:106). As mentioned previously, the task of controlling the rearguard was generally the responsibility of paramilitary groups, although many of these people were also demanded at the front, leaving few behind. The challenge of a few poorly trained individuals driven by a fascist ideology and ordered to maintain control over populations whose loyalties may have been difficult to identify unsurprisingly resulted in paseos. For the Nationalists, despite support from the German Nazis and Italian Fascists in the form of soldiers and war material (e.g., tanks, planes and pilots) and training, a non-intervention pact by many nations (including Germany and Italy) meant that further material support – at least in an overt form – would not be forthcoming.

Geographic. Many of the limitations imposed by geography are consistent over time, and place obvious constraints on action related to the killings: mountains, lakes, international boundaries. The natural place for those who were killed would be a cemetery, and the
initial killings in the civil war repression seem to conform to this. As the failure of the coup became apparent and the number of potential and actual detainees (and thus probable victims of killings) increased, space became a problem both with respect to detention and burial places (e.g., Castro 2006:231, 232; Gibson 1973:74; Jackson 1965:297; Zavala 2006:292, 293). In his 1949 tour across parts of post-war Spain Brenan (1965:134) reports the lack of detention space as a determinant in the killings: “anyone even remotely connected with the Left might find himself arrested and then, unless some person with influence put in a word for him, he would automatically be shot because the prisons had to be emptied to make room for fresh arrivals”. The transfer of prisoners to other detention centres, often for reasons of limited prison space, could have been guises for sacas. Alternatively, the transfers may have been moments of improvised killing with those responsible for the transfer anticipating problems of detention space in the future.

Cemeteries, especially those servicing small towns, were not designed to accommodate the numbers of bodies that accumulated due to the conflict. As the ideological rhetoric increased in the first months of the war, some may have also objected to the burial of the “atheists” in or even at cemeteries. Shootings were commonly outside the walls of cemeteries and this would be consistent with both Catholic cultural tradition of separating Catholics from non-Catholics, suicides, and murderers, among others, (Hughey 1981; Taylor 2002:120) but may also reflect a simple lack of cemetery space. Brenan (1965:134) reports that at the cemetery in Granada: “since the labour of interring

---

9 This custom is evidenced in cemeteries such as the Cementerio de la Almudena, where the civil cemetery is across the road from the main cemetery where Catholics are buried. The Jewish cemetery is further down the road. Notable Republican figures that died after the Civil War such as Dolores Ibarruti, famous for her expression “No pasarán” (they shall not pass) are buried in the civil cemetery. The main (Catholic) cemetery, however, contains a section reserved to honour the members of the Nazi Luftwaffe who died fighting for the Nationalists in Spain.
so many bodies was considerable, they were bundled into shallow cavities from which their feet and hands often stuck out”. Gibson (1973:76, 77) reports the cemetery registry as listing 2,137 men and women who were executed and buried at the cemetery during the war and suggests that this number should be considered an absolute minimum.

Limited cemetery space may explain the change in form of killings from phase 1 to phase 2 as identified above (p. 82); from cemetery killings to paseos and sacas. A move towards road-side killings appears to have been the solution to the “space problem” in the early months of the war, whereas the subsequent creation and use of concentration camps and prison burial sites coincided with the greater coordination of Nationalist authority in general from the winter of 1936 (e.g., Castro 2006:238, 239). Vega Sombria (2005:23) records that of 114 summary executions in Segovia for which the killing and burial place are concretely known only 20 happened at the walls of cemeteries. This ratio probably underestimates the number of non-cemetery burials sites considering that cemetery shootings would be more easily known and likely recorded than others in less public locations.

Principal as a geographic constraint is the road network, upon which the transport of detainees relied. For this reason, roads and distances are important variables in the methodology section below. Specifically, there are several reasons that killers may not have wanted to go into the ‘hinterland’ or rural routes with their victim:

1. It would undermine the objective of terrorizing others;

2. Actions were occurring at night and so tertiary roads would have been more difficult to navigate, especially if there were unfavourable weather conditions;

3. There may have been a fear of lessened security by straying too far from their base, increasing the possibility of encountering guerrilla opposition (“maquis”)
**Temporal.** Night was the overwhelming favoured time for the killing of civilians in the Spanish Civil War rearguard (e.g., Jackson 1965:297; Martín Barrio et al. 1988:398; Thomas 2003:250). This likely reflects several other factors including the killers’ desire for clandestinity as a matter of discretion, the fact that victims were very likely to be found at their homes at night (i.e., rather than at work or elsewhere during the day) if taken directly from their homes, and a greater availability and security of movement for limited personnel (i.e., killers). At the same time, the lack of light during the time of the killings was probably partially responsible for the kill sites being close to the roads, as discussed further in the next chapter.

**Psychosocial.** It should be remembered that in keeping with Kalyvas’ observation of the primary importance of local influence on supra-local orders, many lower-level killers did not share the exact ideals of their political and military bosses. Cenaro (2002:75) notes that many militia members during the Spanish Civil War joined groups whose views were counter to their own ideological leanings, either under duress or as a simple survival strategy (also Herrero Balsa and Hernández Garcia 1982; Vega Sombria 2005:85; Vilaplana 1977:228). In Soria, young Civil Guards ordered to commit killings were reported to be constantly crying while they shot their victims (testimony of grave digger Teodoro González in Herrero Balsa and Hernández Garcia 1982). Even those who simply prepared the graves and buried the bodies were plagued by decades of guilt and psychological trauma (Herrero Balsa and Hernández Garcia 1982:23, 24). A cemetery caretaker in Granada, where thousands of civilians were shot, went mad and was committed to an asylum (Preston 1986:55). Three women, (one pregnant), were executed
at Poyales de Hoyo in December 1936. The next morning a local man decided to bury them. The man died of a heart attack a few days later (Silva and Macías 2003:217-227; Tremlett 2006:20, 21).

Evidence presented above of the conscious nature of the killings suggests that psychosocial factors influence how and why killers behave including possible guilt and knowledge of wrong-doing. This factor probably contributes to the fact of the killings taking place at night. Even if the killers felt justified, they surely anticipated some negative reaction from the general community and in trying to garner support from the population, would therefore have exercised discretion related to both their choice of victims and aspects related to the killings. Psycho-social factors appear to factor into the decision-making of the authorities as reflected by the following category.

**Political.** The need of support from allies as the civil war went on meant propaganda and positive publicity were important. More specifically, due to the nature of the civil war and critical nature of support or opposition from major powers, negative publicity was to be actively avoided. Political sensitivity to the killings evolved quickly over the course of the first part of the war. Vilaplana (1977), who was responsible for investigating deaths in Burgos, described a case where a paramilitary killer drove a car over a victim he had just shot, claiming that to do so would prevent identification. Vilaplana recounts that when he and a colleague complained to an official about the increasing numbers of unidentified bodies appearing and the lack of investigations, the reply was: “It’s that we are cleaning up the rearguard... but anyway what you tell me – my god!- it is incredible and we cannot continue this way. This must stop. From tomorrow I will declare that things be done differently and, above all, - my god – that the
bodies always be buried and well”\textsuperscript{10} (p.48). Over the course of about a year, Vilaplana noted a change in the form of repression from clandestine killings to courts martial, which he claims had been advocated by foreign fascists supporting the Nationalists. Gibson (1973:109) also discusses the knowledge of the Civil Governor in Granada of the damage to the Nationalist cause – both at home and abroad – that would result from the killing of Federico García Lorca. Gibson contends that the Nationalists, recognizing their poor judgement in killing García Lorca, propagated allegations that his killing was commensurate with Republican atrocities “in order to counteract the international outcry which he now realised must ensue” (p.111).

Herrero Balsa and Hernández García (1984) report that in a city in Soria, a municipal employee responsible for public cleaning services came across the body of someone who had been executed. Not knowing what to do, he loaded the body onto the truck and brought it to office of the Civil Governor, where many people saw the body in the truck. He was fired. This incident demonstrates both the knowledge and complicity of the municipal government as well as their lack of efforts (at best) to deal with the summary executions. The objective of terrorizing would have been served by the presence of the victims’ bodies, but the probability would increase that the deaths would receive greater attention (e.g., from the press) or warrant an official investigation, and they therefore violated a political taboo. The authors state that the concern and complaints to the authorities by locals in Lubia (Soria) over the sudden appearance of cadavers across the landscape instigated the advance preparation of graves for subsequent

\textsuperscript{10} “Es que estamos limpiando la retaguardia – nos dijo – De todos modos eso que me cuentan ustedes, ¡caramba! es muy fuerte y no podemos seguir así. Esto tiene que terminar. Desde mañana procuraré que se hagan las cosas de otro modo y, sobre todo, ¡caramba!, que los entierren siempre y bien. Es preciso acabar con esto de los hallazgos”
victims of *paseos* and *sacas* (p.29). The victims from these killings were mostly brought from a prison in Sigüenza, several towns to the south, suggesting a deliberate attempt to dissociate the bodies of the victims from their origin. Furthermore, the locations of the kill sites were about equidistant between the city of Almazán (to the south, closer to the origin) and the smaller town of Lubia. That the smaller town should take responsibility for disposal of the bodies confirms the impression that killers and the responsible authorities in origin towns or cities wanted to avoid responsibility for the killings.

A further example comes from Jackson (1965:300) who reports that General Mola sent a peremptory telegram to authorities in Valladolid demanding that they select more conspicuous locations for executions and that they bury the dead more rapidly (also Thomas 2003:250, 251). Finally, Castro (2006:220) relates the testimony of a witness to killings in Burgos who told of a mandated change in the manner of the killings because of the scandal they were producing: killing the bodies in places that were less public and burying them more carefully to prevent scavenging by animals. These examples demonstrate the sensitivity of the governing Nationalist rearguard authorities to the sentiment of the general population with respect to the repression in their attempt to manage and maintain conquered territory, consistent with the thesis of Kalyvas.

Civilian and ‘sensitive’ victims (e.g., women, children, the famous poet Garcia Lorca) appear to have been treated more clandestinely than others (e.g., see Sevillano Calero 2004:23; Tremlett 2006:20; Vilaplana 1977:38). For killings that could more easily be justified (e.g., former combatants, and in some places leading politicians), they were more likely to be staged publicly or in more public places (e.g., the walls of the
cemetery) (Botella López pers. comm. 2009; Gibson pers. comm. 2010). This reflects the political agenda and sensitivity of the authorities with respect to the killings.

A final example of the political sensitivity related to killings comes from the massacre at Badajoz and explains the transition from phase I to phase II killings. Several international journalists including American Jay Allen witnessed and reported the detentions, killings and the subsequent smoke emanating from the burning of the bodies at the cemetery. After Allen had a report on the killings published in the Chicago Tribune, speakers in the United States were paid by the Nationalists to denigrate him and cast doubt upon his testimony (Preston 1986:61; see also Brenan 1960:322 fn1). As Regan (2009:112) observes, foreign governments can overlook the use of repression by a government or party in a war as long as it is “not overtly visible”. As foreign support had become critical to a Nationalist victory, the move from overt killings to clandestine burial and legalized executions is understandable.

Nationalist authorities were questioned about this and responded defensively (e.g., Yagüe quote above). The negative publicity, however, may have been responsible for a change in policy towards more clandestine killings. Armengou and Belis (2004:78) state it this way:

After taking Badajoz, the Francoists went from euphoria to preoccupation: the massacre had turned the world away and had converted into a scandal; the dead went from being one more trophy in the long triumphal march to being a problem. Franco and his generals had planned a way of annihilating the adversary and they had applied it, but they had not counted on a further enemy, unforeseen and unknown, which was not counted in military terms: international public opinion... the repression would continue being cruel and indiscriminate, as it had been designed.

---

11 The author thanks Professor Jordi Estevez of the Autonomous University of Barcelona for this idea.
but it would begin to be enacted more carefully not so much in form but in how many traces of it would be left (see also Brenan 1960:317).

4.3 Conclusions

The current system of international law enforcement, as evidenced by the Nuremberg trials, the UN tribunals for the former Yugoslavia and Rwanda or the International Criminal Court strongly suggest individual onus for atrocity crimes. To a degree this works against an acceptance of social psychological explanations of crimes by placing blame on individuals. This is not said to defend those who were complicit and responsible for crimes, but individual convictions seem to imply absolution of other group members of responsibility for killings. The hanging of Saddam Hussein is justice enough for those who conveniently forgot that he was the leader of a large, genocidal political party composed of thousands of other leaders, bureaucrats and avid adherents to their policies. Perhaps this is simply a pragmatic response to the young state of international criminal law enforcement. Documented military orders of prisoner execution from a commanding officer are easier to present in court than arguments about crowd psychology. This trend is changing somewhat with the onset of charges of persons being part of a “joint criminal enterprise” (ICTY 2009). When studying mass killings one must be wary of the legal, often politicized and pragmatic presentations and interpretations of probably limited evidence.

Waller (2006) identified the factors and conditions that are observed in cross-cultural studies of mass killing. His thesis asserts that the killers are rational, calculating actors albeit operating in a pathological context (bounded rationality). This fact that the
killers employ a logical, rather than a pathological, thought process facilitates study and prediction of their behaviour. Kalyvas’ study of the logic of selective civil war violence compliments the work of Waller by exploring the socio-political dynamics of killings. Specifically, Kalyvas accentuates that the lack of resources generally available to killers results in more predictable patterns with respect to their use of targeted violence against civilians. This lack of resources forces killers to rely on collaborators in localities who draw up “death lists” of potential or actual opposition to the incoming authorities.

Using the work of these two authors as a theoretical foundation and referencing studies on the Spanish Civil War rearguard repression we find that the primary aim of the killers is one of eliminating perceived enemies and terrorizing other potential enemies. The mechanisms of the killers basically comply with following orders and performing their work well. Killers are often able to perform the killings by perceiving their actions in a sterile, euphemized way that is a product of their being a small part of a big group in a pathological system with an extreme, idealized goal.

The fragmented and multi-party socio-political character of Spaniards that marked pre-war Spain dissolved with the onset and progression of the conflict and group membership, as with the Falange, increased rapidly. Graham (2005:23) puts it this way: “this enforced reductiveness, the obligation to ‘take sides’, constitutes the coup’s first, and most enduring, act of violence”. This polarization created conditions whereby individual (read: dissenting) opinion was actively discouraged, making behaviour more predictable along “party lines”.

The surrender of individual autonomy and its replacement with group altruism, however, is not a complete exchange, as Kalyvas (2003) demonstrates. Local actors work
their own agendas into that of the supra-local objectives and orders generally so far as it is not inconsistent with the agenda of supra-local actors (i.e., that of the political and military commanders). This calculated action reinforces the logical reasoning that is employed by killers. The logic of actors on all levels, then, can be understood if their objectives and limitations are fairly ascertained. If overall local objectives coincide with those of the higher authorities, (e.g., elimination of the enemy due to reasons of political opposition or personal vengeance), the result appears to be the same. In a few instances literature on Spain suggests a conflict between the two levels of authority where individual Falangists actually tried to stop unjust killings in the south of the country (Payne 248, 249 in Bennassar 2005) and the north (Vilaplana 1978:168, 169). In both cases, however, *paseos* and *sacas* were commonplace resulting in thousands of victims in clandestine burials.

The need for collaboration with killers of people who are familiar with the potential or actual victims speaks to the importance of the lack of resources identified by Kalyvas. The killers come to rely on locals to draw up “death lists” of persons who do or might threaten the legitimacy of the incoming authorities. The lack of resources in civil war includes other factors that constrain the *modus operandi* of killers, categorized here for the violence in the Nationalist rearguard as: resources (material and personnel); geographic; temporal; psychosocial; and political. The interplay between the objectives and constraints of killers resulted in a move away from the cemetery shooting and burials of opposition that characterized the first phase of killings following the coup and Nationalist military take-over of territory. The form of killings soon moved to one that
was more clandestine in nature and has resulted in greater challenges for those seeking the graves of victims in investigating enforced disappearances.

Within a very short period of time after the coup, public killings began to turn into night-time enforced disappearances, which sometimes resulted in the appearance of bodies in the morning outside other towns in the region. This change is theorized here to be the result of several factors. First, as the coup came to be seen as having failed in its objective of a complete take-over and became replaced by a civil war, the need to garner support both amongst locals and foreign governments increased. Such support is hard to justify in the face of wanton mass killing of civilians. At the same time, the perceived need to eliminate the ‘enemy’ persisted and so a new, more covert form of elimination was imposed while still enabling the new regime to obtain the acquiescence of the local population via the vision of victims lying in roadside ditches and fields on the outskirts of the towns and cities.

In conclusion, the logical nature of the decision-making processes of killers in combination with known objectives and constraints allow researchers to identify limited geographic areas that reflect patterns of perpetrator decisions about where to kill their victims. This chapter has explained these factors and dynamics, which in the following chapter are examined in a more concrete form via variables and variable categories that will be statistically tested and then used for modelling the results of killer behaviour. Statistical analysis using a geographical information system platform of the relative influence of these variable categories across the killer landscape can be used to project areas of varying suitability for burial places of disappeared persons.
4.3.1 Main and Sub-hypotheses

The following hypotheses have been developed as a result of the work presented in this chapter. The main hypothesis is that the selective killing of non-combatants by the Spanish Civil War rearguard resulted in patterned kill site locations. Several sub-hypotheses were posited to examine more closely aspects of the decision-making processes and behaviour of killers that resulted in patterns. The results of the tests in the following chapter, supplemented by literature on the Spanish Civil War killings, will be used to assess the validity of the sub-hypotheses. Should the sub-hypotheses prove true, they constitute sufficient evidence for acceptance of the main hypothesis. The assessment of the validity of these hypotheses, (see Chapter 7), is qualitative and so should not be confused with the statistical testing of the variables in the following chapter, which, for example, examines the ability to reject a null hypothesis and rests on a quantified value.

Main hypothesis: The locations of clandestine graves of those killed by Nationalist rearguard paramilitary in the first months of the Spanish Civil War are patterned. They share several common spatial characteristics that make their location amenable to predictive spatial modelling.

Sub-hypothesis 1: Despite the general impunity of the killers, they actively avoided possibility of witnesses to rearguard extrajudicial executions of civilians.

Sub-hypothesis 2: Victim identification will affect the degree of clandestinity of the killing site: the more socio-politically sensitive the victim, the more clandestine the kill location.
Sub-hypothesis 3: The number of victims will affect the degree of clandestinity of the killing site. Killers expect a stronger negative reaction by the local public to large-scale killings and so will go to greater lengths to obscure them.

Sub-hypothesis 4: The more rural the origin site, the less clandestine the kill site will be.

Sub-hypothesis 5: Victims were killed closer to a town that was not the town where they had been detained. Kill site selection by this criterion would frustrate potential identification.
5.0 Materials and Methods

This study conducts spatial analyses of various aspects of clandestine grave locations in Spain and develops three different predictive models: one inductive and two deductive. The objective is to quantify, understand, and predict the behaviour that resulted in extra-judicial killings and clandestine burials of civilians by the Nationalist rearguard of the Spanish Civil War. Logistic regression is used with the inductive model to help weight values of independent variables of known sites and randomly generated non-sites for the production of a suitability map of clandestine grave locations. The relative weights of independent variables for the deductive model, as its name suggests, are derived through a combination of logical reasoning, oral and written reports on actors and events in general, and theoretical assumptions about offender behaviour based on personal experience in the investigation of clandestine graves. The unit of analysis is the land parcel, (or in the terminology of the GIS: the grid square), and the dependent variable is grave location.

This chapter will begin by discussing the data used in the study followed by a review of the analytical methods employed. The chapter ends with a discussion of limitations related to the methods and interpretations that can be drawn using these methods.
5.1 Data Sources and Collection

5.1.1 Literature Review

Due to the very recent nature of investigations of Nationalist rearguard killings of civilians in Spain, virtually no comprehensive literature exists in English. Although there are many thorough and excellent English-language accounts of the causes, socio-political dynamics, course and consequences of the war, several with estimated numbers of those killed, they are mostly written by historians and their focus is historical and general (e.g., Beevor 2001; Jackson 1965; Payne 2006; Thomas 2003). This study reviews Spanish and English-language literature on the Spanish Civil War and specifically the Nationalist repression as it relates to grave locations.

In Spain, the summer fieldwork season coincides with a book fair in Madrid, in which hundreds of local and regional booksellers and printing companies exhibit and sell their most recent or other selected publications. This allowed for the personal acquisition of many very recently published books available only in Spain. Additionally, I was granted access to the excellent literature collection of the Spanish government’s Consejo Superior de Investigaciones Científicas (or CSIC, Spanish National Research Council, in English) via the Tomás Navarro Tomás library, where the bulk of literature on the subject resides.

Some relevant, primary publications from the years of or immediately following the Civil War are virtually unavailable as attested to by several authors. An example is Crímenes en la retaguardia rebelde (Crimes in the Rebel Rearguard), published in Cuba in 1939 by Félix Gordón Ordás who fled Spain towards the end of the war (Zavala 2006:358). In such instances, secondary sources were used for this study.
The literature demonstrates significant debate about the nature, scale, responsibilities and the course of the repression on both sides of the war. One of the most famous (or infamous) recent publications is the polemic and apologist *Mitos de la Guerra Civil* (Myths of the Civil War) by journalist Pío Moa (2003). Despite Moa’s book being very popular, it has been criticized by different historians as reiterating Francoist propaganda by denying the scale of extra-judicial executions by the Nationalists (e.g., Espinosa 2006:238, 248). The impact of the official story of the war as written by the Franco regime persists – both in print and in the minds of the people who lived during the Franco era, those who still whisper when they speak of the crimes 70 years later (Ferrándiz 2008).

Espinosa (2009) has published a very recent comprehensive review and compilation of historical studies on the Nationalist repression, both during and following the war. He reports that of the 50 provinces in Spain, 35 have been investigated (by historians) completely and 15 partially, documenting a minimum of 129,472 dead due to the Nationalist repression (i.e., non-battle deaths) (2009:440-443). This is a significant increase from Juliá’s 1999 estimation of 90,194 (p.412, 413), illustrating both the productivity of recent investigative scholarship and the massive scale of missing persons in Spain. Espinosa’s review also demonstrates the increasing interest of historians on regional aspects of the repression, which can be useful to spatial analyses and modelling differences in scale and form across different areas throughout Spain (see section 7.5.3).

In general, the two most prolific authors on the Francoist repression have been Espinosa and Julián Casanova, both of whom were listed as expert advisors to the aborted investigation of crimes against humanity by Spanish judge Garzón. Particularly
significant regional analyses that are relevant to this work and have been referred to in this study have been published on the provinces of Burgos (Rilova Pérez 2001), Cáceres (Chaves Palacios 1995, 2004), La Rioja (Hernández García 1984), León (Oblanca and Serrano 1987); Palencia (Palomares 2002), Soria (Hernández García 1984), and Valladolid (Martín Jiménez 2000; Palomares 2001).

5.1.2 Excavation and Other Reports

Due to a lack of resources and the politically sensitive nature of the work, very few written accounts and virtually no professional archaeological reports exist of the first excavations of clandestine graves performed in the late 1970s and the exhumations between 2000 and 2005. The exception to this is the work supported by the Basque regional government through the Aranzadi Society of Sciences (Sociedad de Ciencias Aranzadi). This work has been conducted by a team of professional historians, archaeologists and anthropologists, all with the aims of investigating enforced disappearances, documenting related historical events, identifying and repatriating victims to surviving family members. In the summer of 2008 I spent a week at the offices of Aranzadi where I was very kindly given access to all files on work conducted up to that point in time. Several printed site reports were also given me, for which I am extremely grateful. Throughout my research, members of the Aranzadi team have assisted me with information about past and current excavations.

In 2006, the office of the presidency of Spain began to support grave prospections and excavations with limited funding, mandating the production of reports. ARMH, as the most prolific organization in this field, has been the principal recipient of this funding and so has produced the greatest number of grave excavations and reports. All reports
completed between 2006 and the summer of 2009 were made available to me. Data from another site used in this study’s sample (Cincovillas, Guadalajara) came from an account of the excavation by the *Foro por la Memoria* (Memory Forum), a communist non-governmental organization, published in the Spanish archaeological journal *Complutum*. Additionally, press releases, press reports and related NGO websites and documents were consulted for minor but relevant details that may not have been included in excavation reports.

Sites used in this study and their source(s):

**Aranzadi**: Altable; Benegiles; Berlangas de Roa; Canillas de Esgueva; Fustiñana; Guaza de Campos; Navarrevisca; Parrillas (3); Pepino (2); Areas/Ponteareas; Robledollano; San Pedro Mallo; Villalquite; Valverde de la Vera.

**ARMH**: Arandiga; Balboa; Carucedo; Magaz de Abajo (2); Naveros de Pisuerga; Villamediana; Pinilla de la Valdería (2); Grajal de Campos; Izagre-Albires (2); La Robla; Quintanilla de Combarros; San Pedro Mallo; Villalquite; O Amenal; Areas-Ponteareas; Santalla; Quintana de Rueda, Toral de Merayo; Xinxo-Ponteareas.

**Other, sources** (press, other literature, pers. comm., ARMH branches; FORO): Ampudia; Barahona; Cincovillas; Murrillo de Gallego (2); Priaranza del Bierzo; Robledollano; Viguera (2).

Many reports related to burial sites that were beyond the scope of this study: of guerrillas who were killed in pursuit, cemetery burials, battle casualties, where prospection found no grave or where only preliminary investigation had been conducted (and not prospection and excavation), etc.
5.1.3 Site Visits and Excavations

In four cases used for predictive model development, excavated sites were visited and this helped establish the validity of reported information. At one location (Quintana de Rueda) the author participated in the excavation of the graves and exhumation of the victims. In a further three cases (Pepino I and II, Robledollano), sites were visited some time after the excavations had taken place. A form had been designed for the recording of site data, an example of which (translated into English) can be found in Appendix B.

5.1.4 Maps and Related Data

Cartographic data on Spain are increasingly available both commercially and publicly. A government-compiled catalogue of all public (i.e., free), digitized maps of Spain is available at: http://www.idee.es/CatalogoServicios/cat2/indexWMS.html. Unfortunately, the project is still in progress and so many digital maps listed were unavailable at the time of this study. Furthermore, it is only possible to view these maps in a GIS, not manipulate or analyze them as is necessary for predictive modelling. Although the Spanish government’s National Geographic Institute (Instituto Geográfico Nacional, www.ign.es) produces maps at the scale used for this study, many are not available in digital format and those available are in a format that is not compatible with ArcGIS, the software used for modelling in this study.

The developing nature of geographic information science and related technologies has resulted in very incomplete datasets in Spain and these are not easily obtained by those with limited funding. The author of the study worked with two colleagues in the
SFU department of Geography (Liliana Pérez and, especially, Sonja Aagesen) and particularly a Spanish archaeologist (José Maria Navarro Gómez) to acquire and develop all available and appropriate maps. Lower-level government bodies in Spain that govern the autonomous communities have also made various digital maps pertinent to their administration, which can be downloaded via the Internet. One of three road network maps that were used came from the website of OpenStreetMap (www.openstreetmap.org), via the website MapCruzin (www.mapcruzin.com).

Finally, several maps were acquired via Pennsylvania State University Library’s Digital Chart of the World (www.maproom.psu.edu/dcw). Maps employed included: road networks; two with polygon and point data respectively representing the population density of municipalities in the 1970s (the earliest data available) and populated areas such as towns and cities; land use; and administrative boundaries of Spain, Spanish provinces and the autonomous community of Castilla-Leon. Two further maps were created with data from detention and gravesites used for the creation of the inductive model and for testing of both models. The digital maps used for modelling represented landscapes and features as recorded from 2000 to 2005, but these were checked against 1:25,000 scale scanned maps from the 1930s and 1940s to ensure that significant changes had not occurred that would negatively affect modelling. Only transportation routes available around the time of the killings were used for analysis. The map layers used and their sources are listed in Appendix C.

Map scale is an important consideration in predictive modelling. It is important to endeavour to have the same scale maps for each layer to avoid error propagation that can occur when combining scales of different definition. Careful consideration of scale is also
particularly important with smaller measurements such as the distance of a grave from a road. On a small scale map (e.g., 1:100,000), a road will be represented so that it can be seen, but the width of that representation will be much greater than the width of the actual road. Categories of variables that would be affected by problems related to map scale were therefore created to avoid error at the cost of precision (e.g., categories of “distance from road” were 0-40 metres and 41-80 metres rather than 0-5 metres and 6-10 metres). Most archaeological predictive models have been developed with maps at a scale no larger than 1:50,000 (e.g., Vaughn and Crawford 2009). This study endeavoured to meet the same standard and doing so was deemed important as the sites being predicted, graves no more than 15 metres in length and three metres in width (though typically about 2 x 1 metres), are small. In predicting sites of such a small size, a scale of 1:50,000 could be insufficient. It is important to emphasize here that the primary aim of this study is not to create an unrealistic “x-marks-the-spot” map, but one which identifies larger areas of varying probability. Predictive modelling will identify particular areas of high probability, areas that are larger than the grave itself but that could then be searched using other archaeological methods such as geophysical techniques and test excavation to better identify actual burial sites.

5.1.5 Interviews of Investigators and Witnesses

It was valuable to speak with people involved in the investigation of disappeared persons in Spain. This served as a reliability check for the reports being produced as well as to gain information that may not have been included in the reports. Quantitative analyses have seldom been performed and published on the work related to grave excavations or the remains exhumed from these killings and oral testimony helped
provide a basis for the selection of independent variables and categories of the deductive
models. Testimony was taken in the form of informal interviews with the following
persons: Dr. Francisco Etxeberria Gabilondo, Jimi Jiménez (Aranzadi), Marisa Hoyos
(Nuestra Memoria Sierra y Gredos), Fernando Magan, Santiago Macías, José Ignacio
Casado, José María Rojas, Carlos Agüero, Iván Ortíz Chanes, Almudena García Rubio,
(ARMH), Raul de la Fuente (Psychologists without Borders), José María Pedreño
(President of the State Federation of Memory Fora), Francisco Moreno Gómez
(Historian, Córdoba), Francisco Ferrándiz (Spanish National Research Council), Scott
Boehm (University of San Diego), and families or advocates of victims in Retamosa and
Villanueva de la Vera (Cáceres), Pepino (Toledo) and Milagros (Burgos). Where oral
testimony is cited in this work, the respondent’s explicit permission has been obtained, in
accordance with the ETHICS POLICY #38275 of Simon Fraser University and as agreed
upon prior to beginning this research.

5.2 Sample

5.2.1 Site Data

Prior to 2006 when the Spanish federal government began providing limited
funding for civil war grave excavations, archaeological reports of excavations were
seldom produced. The result has been an absence of reliable spatial data on the majority
of graves excavated to date in Spain that can be obtained in any way other than visiting
every town where an exhumation has taken place and locating reliable witnesses to take
the researcher to the place. The sample used for this study consists of data from 47
excavated clandestine gravesites across the west and north of continental Spain,
containing between one and 16 persons each, for which relevant grave excavation data could be acquired by me. A table of the sites and variables is in appendix D.

5.2.1.1 Variables

The dependent variable in this study is the site (or in the case of the inductive model, which uses logistic regression and so requires a discriminant sample, both the site and “non-site” locations). Independent variables employed in the inductive model were chosen preliminarily via the subjective process of testing all logical variables for which data could reasonably be acquired. The selection of these variables was based on logical reasoning, oral and published testimony and personal experience over ten years and in eight countries in the investigation of clandestine graves, including ten months at several sites in Spain. Some untested variables such as ownership of land on which a clandestine burial was created might have had an influence on site location (e.g., of symbolic importance). However, these were considered to be probably far less influential than other environmental and spatial factors and obtaining such information would be incredibly difficult given the passage of time, resources required to do so and low promise of positive return. Although many authors cite the difficulty or impossibility of including social or cultural factors in models, this study was able to do so to a degree. For the inductive model relational decisions were tested statistically (e.g., distance between origin/detention and gravesite, a test of perceived acceptable distance in the minds of the killers). From those available variables considered to be potentially influential, statistical tests were used to ascertain which actually did have a significant relationship with the location of the grave, as outlined below.
This study differs from traditional archaeological predictive models in the behaviour it studies. Many influential independent variables that are considered by predictive modellers as standard influences on archaeological site location decisions such as aspect and distance to water would not have the same or any significance in this context.

The deductive model naturally makes greater assumptions based upon logical, theoretical reasoning about the thought processes, values, resources, objectives and constraints of the killers. The validity of the variables chosen and their assigned relative weight are qualified or disqualified via the tested accuracy and precision of the model. An important aspect of the deductive (and inductive) modelling process is that it can and should be an iterative process, reformulated as more information becomes available (Dalla Bona 1994a, b). The following variables that are analyzed using statistical tests and/or used in one or both of the models are described briefly below as they pertain to the methodology used for this study:

**a) Number of Victims**

This variable was expected to influence the decisions made by killers in their choice of a kill site. More specifically, greater clandestinity would be warranted for a large number of victims. This is because, as mentioned in chapter 4, the authorities responsible for killings are endeavouring to take full control of a territory and fear a backlash from the public if the killings are seen as excessive or fear a loss of foreign support if mass killings become public knowledge. If victims are taken farther away from the origin or are killed in areas of heavy cover, and are therefore hidden, the general public is less likely to know of the killing and less likely to protest.
b) **Distance Travelled between Origin and Kill Site**

In some cases used in this study victims were detained for a brief period of time in a detention centre such as a local jail before being taken out and killed. In other instances, victims were taken directly from their homes or workplaces. For this reason I have used the expression “origin” to indicate the starting point in the trip preceding the killing of the victim(s). “Kill site” refers to the place at which the victims were shot and where they may or may not have been buried. In some cases, victim bodies were recovered by family members or others and buried in the nearest cemetery. The important location for this study is that in which the killers chose to shoot their victims as this represents the location that would be modelled in the case of an unknown burial site (in contrast to cases where victims were transferred to cemeteries and the presence and location of the victims, therefore, would be more widely known).

For the purposes of uni- and bivariate statistical testing, this independent variable was measured by taking the point on the outer limit of the origin polygon (e.g., town limit) to the side of the polygon towards the kill/gravesite. It may have been more accurate to plot the actual detention centre, within the polygon, or even a central point. In many cases, however, reports only reveal the place names (e.g., town) where people were detained and not the specific detention location, or reports cite a location that is not readily identifiable (e.g., the military governor’s house in 1936). This consideration, in association with my assumption that the killers were transporting their victims to a place where the killings would not be witnessed by the general public led to the decision to plot the distance from the detention town’s edge (i.e., the point from which the killers began to go from widely visible to out-of-sight, keeping in mind that the killings were committed almost exclusively at night). It stands to reason that as one objective of the
killers is to avoid eye witnesses to the execution, the edge of the populated area (rather than the center or absolute point of the detention place) is the cognitive spatial marker that is associated with the beginning of the assessment of the suitability of a kill location (see also Canter and Hodge 2000:188, 189 for more on cognitive reference points). In any case, the distance from the centre of most of the origin sites (small towns) to the outskirts is a matter of only about 200-400 m and not expected to significantly affect results for this single variable. Measurements of this variable were taken via the online map browser of the National Geographic Institute of Spain,
(http://www.ign.es/ibepix/visoriberpix/visorign.html) from a 1:25,000 scale map following the most direct road(s) that existed at the time of the killing.

For the inductive and deductive models, distances were calculated by generating euclidean distance surfaces from which measurements could more easily be derived and transformed into a probability surface. Although this method is less precise than following the road network, the labour that would be required to hand-measure distances across the entire study area for every populated area from which a person may be missing is untenable. In specific searches for individuals, however, precise measurements could more easily be employed.

c) Land Use/Cover at Kill Site

Data for this variable came from several sources, though principally thematic historic maps at a scale of 1:25,000 that are available via the cartography section on the website of the Spanish government’s National Geographic Institute (http://www.ign.es/ign/es/IGN/cartoteca_Maptopo.jsp). On every one of these large-scale maps is a key that indicates the land use. This information was further supported by
the oral testimony in some reports, which noted for example, that the bodies were buried in an olive grove or by a stand of oak trees (e.g., Berlangas de Roa, where victims were allegedly buried in a poplar stand, or “chópera”). In the case of one grave at Milagros, the land had been used (and continued to be used at the time of excavation in 2009) for growing hay. During excavation, hay seeds were found in the folds of the clothing of at least two individuals, which began to sprout with re-exposure to air and sunlight, providing confirmation of the land use and season in which the killings took place. The alleged timing of the killings also coincided with the second season for sowing seeds (August).

Four categories are used in this study, ranked according to the type of place where the bodies would be most likely visible: farmed field; open ground/pasture; lightly covered ground; and heavily covered ground. It is logical to believe that the choices made about ground cover reflect the degree of clandestinity desired by the killers. If the bodies were killed and left on farmland, it is assumed that they would be discovered very quickly whereas the opposite is true for land with heavy cover. Open, unfarmed pasture (e.g., “Erial a pastos” on maps) was given a rank of 2. Olive groves (olivar) or orchards (huerto), although technically being cultivated lands, were considered to provide light cover and so ranked 3. Unfarmed, hillside brush (monte bajo) was also ranked 3 considering that it would be covered by wild plant life and the occasional tree. Forested areas were given a rank of 4. The source and nature of these data, PDF files scanned from 1930s and 1940s maps, was such that it was decided to use this variable only in preliminary statistical tests and not in predictive modelling. This is because of the compounding error that would likely occur as a result of taking map data from maps that
were produced at least seventy years ago (although perhaps simply reproduced from much earlier maps), converting the maps from PDF format to one compatible with ArcGIS software and the different scales of other maps being used in modelling.

\textbf{d) Road Side}

The side of the road on which a clandestine grave would be found was considered to be a relevant factor. It was hypothesized that a grave would more likely be located on the right side of the road (on which Spaniards drove in 1936). This variable is testable taking into account the direction of travel derived from the locations of the origin and kill sites.

\textbf{e) Road Type}

Three road types were identified using modern maps and then verifying them with maps available to the closest date of the killings: primary, secondary and tertiary. Primary roads were generally two lane roads that connected larger urban centres and have generally continued in use today, though in some instances have been replaced by four-lane highways. Secondary roads are two lane roads that connect smaller urban centres with each other but also with larger urban centres. Tertiary roads were taken to mean anything smaller than the previous two categories, typically unpaved rural roads.

There is a small degree of relativity involved in this category and the three road types should not be considered as being equal across all sites. For example, in some cases, only secondary and tertiary roads existed in the area of the origin and kill sites. In these cases if the easiest and most direct route of travel was technically a secondary road and no primary road existed, then secondary was considered as primary. This decision was made based on the assumption that the killers chose between options of more or less
frequented and passable routes. Where only two options were reasonably available, the
decision was a dichotomous one. In cases where all three road types were accessible, the
decision was slightly more complex but would reflect similar thought and decision
processes (more versus less clandestine) and thus classifying a secondary route as a
primary where no primary routes existed would fairly measure the decision made by the
killers. Maps from around the time of the killings were examined for all sites used in this
study to assess the choices of road types available to the killers.

Although many roads in Spain have been repaved and reconstructed along the
same paths of previous roads, many high-speed motorways have been constructed since
the time of the events under study (e.g., “autovías”, and “motorways”, as labelled in the
attribute tables of the road maps). These irrelevant routes were deleted so as not to model
features that did not exist at the time of the killings.

f) Soil Type

Most APMs test soil type as a potential influence on site location (e.g., Conolly
and Lake 2006:181; Wescott and Brandon 2000; Wheatley and Gillings 2002:90;
although see Wescott and Kuiper 2000 for potential problems with this variable). In this
study, it was believed that soil type might be considered by the killers in consideration of
having to dig a grave. Oral testimony of this as a consideration with respect to graves
created in the province of Soria in 1936 is given by Herrero Balsa and Hernández García
(1984). The overall influence of this variable, however, was considered dubious for two
reasons: 1. Land use could over-ride soil type (e.g., in ploughed fields superficial graves
could easily be dug irrespective of soil type); and 2. Many bodies were left by the killers
on the surface and only later buried by other locals who had no role in the site location decision.

g) Slope

Although slope is generally considered an important factor in conventional archaeological site location, it has a different significance in the context of this study (i.e., would be perceived differently by those selecting sites). As Nationalist rearguard killers seldom buried their victims, a slope with a medium or low grade would probably not have acted as a strong deterrent to site selection. The killers would have been able to shoot from the even surface of the road while the victim(s) stood on the slope. Nevertheless, the only digital elevation model (a map created by digitizing vector elevation map data) that could be acquired for this study has cells of 100 m x 100 m representing a fairly imprecise measure. This problem is compounded considering that the slope is calculated by measuring the maximum degree difference between two cells, resulting in a minimum slope definition of 200 m x 200 m. Although slope is considered to have influenced kill site selection, it was decided that without better map data, it should not be modelled.

h) Distance Last Town

The distance between the last town travelled through on the way to the kill site (in half of the cases this was the same as the origin) is judged to be significant as it represents the killer’s consideration of the minimum distance necessary to travel outside of a populated area before killing victims.
i) **Distance Next Town**

Distance to next town, (that beyond the grave), was considered as possibly influential on grave location selection for various reasons including the above-mentioned considerations of avoiding witnesses to the killings and also putting the bodies into a municipal legal jurisdiction that was distinct from that from which the victims came (to frustrate identification). Distance was calculated in the same manner as for the previous distance measure variables.

j) **Distance Road-Grave**

This variable addresses the belief that kill sites are more likely to be close to roads. This is believed to be the result primarily of two factors: leading detainees at night for long distances from the road and vehicle increase the possibility of detainees escaping and the relative impunity with which the killers operated meant there was little reason for them to expend great amounts of time and energy hiding the victims by moving them far from where they would be seen by others.

k) **Female(s) among Victims**

It was hypothesized that in the five cases where one or more females were amongst the victims the distance between origin site and kill site (another independent variable) would be greater than at sites without female victims. This is for reasons derived from discussion in the previous chapter about the knowledge of wrong-doing by the killers in combination with a culture of machismo and socio-political sensitivity. In the eyes of the killers, females would constitute more socio-politically sensitive victims and therefore their killing/burial would be conducted in a more clandestine location. To kill a woman, particularly a non-combatant, would have been to violate a greater taboo.
than to kill men (see section 4.1). Statistical significance was tested between this and other independent variables.

1) Population Density Change

Population density of origin and respective kill sites were examined. If kill sites were overwhelming in less populated municipalities than the origin locations, this information could support the hypothesis of movement towards more clandestine areas when perpetrators killed their victims to avoid witnesses to the killings. Municipalities are defined here as the smallest political and administrative unit in Spain (after national; autonomous communities; and provinces), and should not be mistaken as representing a single town or city, although they typically centre on a town or city. The map used was obtained via the Web Map Service (WMS) of the Spanish government and displays municipalities across Spain that are colour-coded according to population density using eight graduated bands. The oldest data available in this format was from 1970. Although population data of cities and towns is available dating back to the killings, population figures for kill sites, which were outside of towns, is not available. For this reason, the 1970 polygon data were considered most appropriate.

5.2.2 Non-site Data

Two sets of random cases were generated for this study. The first was created to test the significance of variables related to the trips made from origin to kill sites for known sites. For example, the frequency of categories for “Land-use/cover” at known kill sites can be recorded. In order to know if the frequencies are significant, one would have to know how frequent all of those categories are across the entire study area.
Alternatively, a group of randomly generated trips (consisting of origins and destinations) can create a comparison group against which significance can be measured.

Random trip values for a comparison “non-site” group were created using Microsoft Excel. The non-site values generated were constrained to similar parameters of the site sample (a maximum distance between origin and kill site of 45 km, sites were limited to lying near roads, they were generated in the same provinces as the site sample and the maximum number of victims was 16). By establishing similar parameters to the site sample any differences detected could be accepted with greater confidence.

Using the actual site origins as starting points, 100 non-site cases were generated (100 random selections of the original 47 sites). For this non-site sample, certain variables were randomly generated: “Road side”; “Road type”; “Distance travelled”; and “# of victims”. A direction of travel, (including cardinal and intermediate directions, e.g., north, northeast, east, southeast, etc.), was also randomly assigned. Guided by the values for these variables, a travel route could be followed to reach a “kill site” for the random group. If the road type assigned to a non-site case was a tertiary road, the travel route would follow a primary or secondary road for the majority of the distance travelled and when the distance was being reached, a diversion was taken along the nearest tertiary road. This was necessary because tertiary roads are relatively short and in many cases could not be followed for the full random “distance travelled”. Once a random kill site location was determined, the variables “Land-use/cover”, “Towns crossed”, “Distance last town”, and “Distance next town” could be recorded. Three of the 100 cases had to be discarded because the random parameters generated placed them outside of the study area or in a direction that was impossible to travel (e.g., an origin near the Atlantic coast was
assigned a western direction of travel for 25 km, placing the kill site well into the ocean. The values of the variables for this non-site group are in Appendix E.

The second non-site sample was produced for modelling. For the creation of the inductive predictive model using logistic regression, one needs to distinguish the characteristics of land parcels that include kill sites from those that do not. A suitability map can be created by distinguishing features between these two categories (Kvamme 1992). There are problems with assigning the label of “non-site” including limitations of test excavations and cost in terms of resources, so several authors (e.g., van Leusen 1996; Warren 1990) have advocated the generation of random points in the study area to represent non-sites that can be compared to land parcels containing sites. Although there is the chance that a randomly generated non-site point may be a false negative, the probability that this is so is extremely low in this study when one considers the vast area across which very small burials are scattered (as well as burials being clustered non-randomly along roads, see results). Furthermore, Kvamme (1992; 1988b) suggests that random non-sites are more appropriate than those taken from field testing because field testing typically occurs in areas that are favourable for site location.

The non-sites for modelling were created to represent kill sites. This differs from the non-site data generated above because the statistical tests can consider multiple variables related to both origin and kill sites (e.g., “Distance travelled”), whereas predictive models assess suitability of land parcels based only on their characteristics as they relate to kill sites. Fifty non-site locations for this group were created using tools in ArcView. The reason for generating a smaller non-site sample for logistic regression analysis is because unequal comparison groups (i.e., sites and non-sites) can skew
predictions to favour the larger group (Wheatley and Gillings 2002:156). The only restrictions placed on this non-site group were that two sites could not lie within 500 m of another and they were all generated within the modelling area of Castilla-Leon. A map showing the location of the sites and non-sites in Castilla-Leon is in Appendix F.

5.2.3 Sample Justification and Limitations

Data from 47 clandestine, excavated burial sites of those killed by Nationalist paramilitary forces in the rearguard were analyzed. In the interest of limiting variables, only graves resulting from killings of civilian detainees committed by Nationalist rearguard forces were used. This type of victim constitutes the vast majority of those who were killed by Nationalist violence (i.e., exceeding battle casualties, Ruíz 2009) and represents the majority of grave exhumations since 2000, as battlefield casualties, for example, are a lower priority for those investigating cases of missing persons. Victims of those killed by Republican supporters were investigated thoroughly in the 1940s and 1950s as part of the Causa General, a massive-scale and highly political investigation of crimes and killings committed during the war by those resisting Franco’s rebel army and government. Many or most of the Nationalist dead were exhumed during these decades and their bodies transferred to the Valley of the Fallen (see Chapter 3). For these reasons very few exhumations of those killed by Republican supporters are currently being conducted, and data on these were considered unreliable given the context and time in which exhumations of Nationalists took place.

Only sites that had been completely excavated and where human remains were exhumed were considered reliable for this study. In some cases, fewer sets of remains were found than were expected (i.e., than the number of missing persons presumed to be
in the grave). There is ample oral and physical evidence that some victims of killings were exhumed clandestinely soon after the killings. Grave excavations at Uclés (Cuenca province), Quintana de Rueda (León), Villamediana (Palencia) and others have shown clear indications of post-burial disturbance resulting from the deliberate or accidental (e.g., scavenging) removal of human remains from graves. In some cases, these were represented by empty or nearly empty graves (e.g., only small bones of the feet and hands or clothing-related artefacts remained). In Quintana de Rueda, although the grave outline and a subsequent, distinct secondary intrusion were not clearly identified, portions of two bodies at one end of the grave were missing and an elderly local man reported that the brother of a victim exhumed two bodies late one night soon after the burial in 1936 (see Figure 5.1). In other cases, subsequent landscaping, road construction or the installation of trenches for electrical poles or tree planting had disturbed graves resulting in a minimum number of individuals that was fewer than the reported missing. Sites for this study include only those where the number of sets of remains recovered was equal to or lower than that expected (based on preliminary investigations), and in the latter case only when the lower number could be explained by oral and/or physical evidence of past disturbance.
The distinction of ‘clandestine’ grave was considered important to this study. Many of those killed extra-judicially were buried in cemeteries, mostly at the very beginning of the war and then again after several months into the war when courts martial had been set up by the Nationalists to try, typically *en masse*, people that they had detained. For those buried in cemeteries and particularly those who were tried,
registration of death and burial place is far more likely than for those killed and buried in roadside ditches or fields. In addition, because cemeteries are public places and are frequented often by local people, burials would probably be known. Support for this is demonstrated by the high number of exhumations since 2000 of those killed by Nationalist and buried in cemeteries. These graves, despite seldom being marked, are better known by elderly residents and are sometimes marked in cemetery archives. The challenge of finding and recovering “missing” persons who are buried in cemeteries is typically more a question of receiving political and legal permission to excavate and confirming presumed identification. As this study aimed to assist with the location of clandestine graves with missing persons, cemetery burials were not considered. In chapter 4, this study explored possible reasons for the different decisions leading to whether or not victims were killed and buried in cemeteries but the primary objective of this study does not concern itself with the very different problem of excavating publicly known burial places.

In many instances of rearguard killings, victims were allegedly thrown into wells or off of bridges. No reports of victims from these types of disposal sites were found during data collection. Even had they been, it is reasonable to believe that the presence of a well would have influenced site location decisions and so the patterns detected would not reflect the same decision-making criteria as those of clandestine burials. In the case of bodies thrown over bridges, the almost certain post-mortem movement of a body would probably result in a dissociation of the body from the kill site, making confirmation of the

---

12 While the author stands by this claim based on experience in Bosnia, Croatia and Spain, it is recognized that so-called “NN”, or no-name burials in cemeteries do and have posed significant challenges for investigators as evidenced by, for example, work in Argentina (Doretti and Snow 2009; Olmo et al. 2009).
kill site more difficult (i.e., if a body was found floating down the river, identifying the point at which the body had been killed and entered the water would be difficult or impossible).

Unfortunately, very few of the victims exhumed to date have been positively identified through means such as DNA (approximately 8%, Jiménez 2008). For this reason, a sufficient sample of graves for predictive model development and testing based solely on positively identified victims is unobtainable. In a couple of cases used for this study (Priaranza del Bierzo, León; Berlangas de Roa, Burgos), however, at least one of the victims had been identified positively through DNA analysis. Therefore, presumptive identification – based on number and origin of missing persons, oral testimony, and matches of victims with biological and cultural profiles as established by anthropological and material culture analysis – was considered sufficient for this study. Experience and research has shown the tenuousness of presumptive identifications in cases of missing persons (Simmons and Skinner 2006, Wagner 2008). In the context of the Spanish Civil War rearguard, however, these identifications can be considered quite reliable given a combination of factors including victim number, proximity of the grave to the place of detention, “recognizable” artifacts such as tobacco pipes, antemortem fractures reported by family members and the biological profiles (age, sex) derived from anthropology.

5.2.4 Data Preparation

The data collected for modelling was in shape file format (.shp). As mentioned above, the road network was created by combining three different road maps, deleting modern motorways and overlap amongst the roads, and dividing the network into three layers: primary, secondary and tertiary roads. Using the Euclidean Distance tool in the
“Spatial Analyst” tool box of ArcMap, the layers were converted into grid files (rasters) with a cell size of 30 m (i.e., each grid square, or land parcel was 30 m x 30 m). The cell size was selected to be consistent with other archaeological predictive models and represents a compromise between over and under representing features such as sites and the width of roads. The large size of the study area would also produce very large file sizes for map layers, which would require an inordinate amount of memory and computer storage space for calculations performed and suitability maps produced (Dalla Bona 1994a).

5.2.5 Statistical Testing of the Independent Variables

5.2.5.1 Spatial Autocorrelation

As mentioned above, logistic regression has been advocated as the most appropriate way of actualizing inductive archaeological predictive models. A potential problem with the test is that it is not a spatial statistic; one that is designed specifically for the analysis of geographic data. Schwarz and Mount (2006) contend that a spatial statistic may be more appropriate when variables or sites show spatial autocorrelation, although there is no consensus amongst archaeologists about the importance of this (Verhagen 2007:132) and most archaeological predictive modellers appear to not have tested for it. Spatial autocorrelation refers to the fact that objects, features or sites that are closer to each other tend to have similar characteristics (and those farther away have fewer) and it can lead to an overestimation of the predictive power of predictive models (Millard 2005). Moran’s I statistic is a test of global spatial autocorrelation (a test for clustering of attributes indicating variation across a study area) (Anselin 1996). In Moran’s I, results range from -1 (indicating perfect dispersion) and +1 (perfect correlation/clustering).
zero value indicates a random spatial pattern (i.e., no spatial autocorrelation). A p-value, at 99% probability, can be generated to measure for statistical significance of spatial autocorrelation.

Univariate Moran’s I tests of spatial autocorrelation were conducted using “GeoDa” software (Anselin 1995, 1996). The variables tested were: Number of victims; Land-use/cover; Road type; Towns crossed; Nearest town; and Distance travelled. As these tests determine if conventional, rather than spatial, statistics should be used, they were conducted prior to the creation of the models to ensure that the planned statistical tests were appropriate. More details about these tests can be found in Chapter 6.

5.2.5.2 Univariate and Bivariate Tests of the Independent Variables

Preliminary tests of association are generally performed in APM to determine which independent variables have a statistically significant relationship with the dependent variable and also how independent variables may influence each other (co-variation). Variables were tested using SPSS 17.0 software. The results would serve as a preliminary test of the relevance and influence of each of the independent variables on the dependent variable. Statistical significance was assessed at the 0.05 level.

Significant independent variables can then be analyzed further to determine their relative influences and help interpret the decision-making process of the killers. This testing is a necessary step because logistic regression assumes a linear relationship between the independent and dependent variables and confounding variables must be accounted for (Woodman and Woodward 2002; although see also Verhagen et al. 2007:208). Even if single independent variables do not have a statistically significant
relationship with the dependent variable, they can still be used to develop the inductive model as they may have a subtle influence on grave location when combined with other independent variables (through logistic regression).

In most inductive predictive models, the Kolmogorov-Smirnov test is used to compare independent variables of the sample site with those of the non-site sample. To employ the K-S test, variables are divided into categories and the cumulative percentages of sites falling into each category are calculated and compared with those of non-sites. A problem with this test, however, is that any variation in the last category of the independent variable is missed because the cumulative percentages for the last category always equal 1 (i.e., the maximum difference between the cumulative percentage of distribution of sites and cells in the environment is zero), meaning that the last category of the variable is not taken into account.

For this reason, other univariate tests were used as appropriate according to the character of the independent variables. It was difficult to judge whether or not parametric or nonparametric tests were more appropriate. The sample size was fairly small and the distribution of the entire population from which the sample is taken is not known (i.e., if it is Gaussian or not and so whether or not parametric or nonparametric tests are more appropriate). Most published APMs appear to assume that the distributions are not normal and in the interest of consistency with previous models, this study adopted the use of nonparametric tests. This correctness of this decision was affirmed through examination of the distribution of the independent variables (see Chapter 6).

Following Warren and Asch (1990:14), the Mann-Whitney rank-sum statistic was used to check for randomness of continuous and interval data variables. In these tests, site
data would be compared to the randomly generated non-site data to test the null hypothesis of “no difference” between the two groups. Chi-square was used for ordinal and nominal-scale variables. An advantage of the Mann-Whitney test is that it allows comparisons of two differently-sized samples (Wheatley and Gillings 2002:137, citing Shennan), which is compatible with the slightly unequal site and non-site samples used in this study (Site N= 44; Non-site N= 97 for these tests). Spearman’s rho was used to test the significance of relationships between two interval or continuous-scale independent variables. In some instances different tests were used for the same variable according to the type of test (univariate or bivariate) and the data were classed into the appropriate-level for the related test. Variables tested and the pertinent tests included:

**Mann-Whitney:** Distance between origin site and kill/gravesite; Distance last town; Distance next town; Victim number; Towns crossed; Distance between road and grave; and population density change$^{13}$.

**Chi-square:** Land-use/cover; Road side; Nearest road type; Population density change.

**Fisher’s exact test:** Female(s) among victims.

**Spearman’s rho:** Victim number (either as a continuous variable or divided into 3 classes of: 1-2; 3-5; >=6); Cover/land-use (in the original four categories or divided into two groups: tended land and untended land); Distance between origin site and kill/gravesite; and Towns crossed.

---

$^{13}$ For the deductive model, continuous variables must be divided into categories, making them interval-level data.
5.3 Archaeological Predictive Modelling

ArcView 9.3 software was used for the creation of the inductive and deductive predictive models. Both models develop the basic formula of: \[ S = w_1A + w_2B + w_3C \]

Where \( S \) is the site propensity and \( w \) is the weight of the independent variables (A, B, and C).

Although many variables were considered influential and their values measured using uni- and bivariate statistical tests, some do not lend themselves to the predictive modelling and creation of suitability maps according to the methods used here. Suitability is assigned according to the characteristics of each individual unit of analysis (30 x 30 metre land parcel). Some variables, such as “Distance travelled” and “Towns crossed” relate to a second discrete point (i.e., an origin) and so cannot be assigned to each land parcel across the study area. Likewise, “Road side” implies a direction of travel, which cannot be generalized for each land parcel. The fourth variable that could not be used in the predictive modelling was “Number of victims” because it is an attribute that is not associated with each land parcel. Other attributes, such as the distance to the nearest road or nearest town of each cell in the study can be measured and modelled.

5.3.1 Inductive Model Using Logistic Regression

Most authors on inductive models for APM have demonstrated that logistic regression is the most appropriate analytical tool (Connolly and Lake 2006:183; Kvamme 1990b:275; Warren 1990:92-96). As explained above, the first step in this type of predictive model typically involves running univariate statistical tests on the independent variables selected to ascertain the significance of their relationship with the site sample.
and the randomly chosen non-site sample (Connolly and Lake 2006:182; Warren 1990:97).

The second stage of analysis consists of running the logistic regression analysis on site and non-site samples, measuring the predictive power of each independent variable. For a basic description of how logistic regression works, refer to chapter 2. Logistic regression analysis of the variables followed the methodology of Ebert (2002:90, also Kvamme 1990b and Warren 1990). Using the euclidean distance layers in the maps, the distances between features (e.g., sites or non-sites from different road types and populated areas) are calculated with the zonal statistics tool in ArcMap 9.3 and presented in tabular form in an SPSS spreadsheet. In the spreadsheet each site has a value for each of the different variables.

From these tables, values for the logistic regression equation are derived. The logistic regression equation is:

\[ y = \beta_0 + \beta_1 x_1 + ... + \beta_n x_n + \epsilon \]

Where \( y \) is the response variable being predicted;

\( \beta_0 \) is the intercept value, or constant; and

\( \beta_n x_n \) are the modifiers (\( \beta \)) and the variables (x).

This is done for “n” number of variables (Hosmer and Lemeshow 2000). Logistic regression analysis produces a predictive model equation that takes the form of:

\[ V = a + x_1 b_1 + x_1 b_1 ... + x_n b_n \]

Where:
$V$ is the log odds of site presence;

$a$ is the intercept;

$b_1, b_2, \ldots, b_n$ are the regression coefficients that determine weighting applied to each of the

$n$ attributes, $x_1, x_2, \ldots, x_n$.

Logistic regression returns a value for independent variable influence on the dependent variable in the range of 0 to 1. The results are used to assign the relative weights of the independent variables within the predictive model formula. Using the raster map algebra function in ArcMap, each cell in the study area is given a weighted sum according to the relative influence of the independent variables and the spatial relationship between these and each grid square in the study area. The values calculated for the study area are then normalized to lie between zero and one. This range is then divided into three equal groups representing three probability zones: 0-0.33 (low probability); 0.34-0.66 (medium probability); and 0.67-1 (high probability).

### 5.3.2 Deductive Models

The weighted intersection method, (also called the “CARP” method) as described by Dalla Bona (1994a, b; Dalla Bona 2000) formed the basis of the deductive models in this study. The operations followed those advocated by ArcGIS in their document: *Using the conceptual model to create a suitability map* (ESRI 2009). Not all of the variables selected for analysis could be modelled.
5.3.2.1 Deductive Model 1

The creation of the first model involved identifying independent variables to be modelled via deductive reasoning based on knowledge of the context and beliefs about killer objectives and constraints. Independent variables that could be modelled were given different values on a scale of 1-10 according to their hypothesized influence on site location decisions. The variables were then divided into various categories, for which category weights were also deductively assigned. The overall weighted value of a category for creating the probability map was determined by multiplying the independent variable value by the category weight. Each cell in the predictive model map reflects a sum of the pertinent weighted values, demonstrating the deduced attractiveness of a location in the eyes of the killers. Category weights in each independent variable were assigned using the Reclassify tool (Spatial Analyst Tools => Reclass => Reclassify).

Once the category weights have been assigned, each independent variable (map layer) is given a relative weight using the Weighted Overlay tool (Spatial Analyst => Overlay => Weighted Overlay). Unlike the inductive model using logistic regression, the deductive models consider the individual influence of independent variables on the dependent variable and then adds them together. The following table shows the variables that were used for the first deductive model, the assigned variable values, variable categories and their respective weights.
Table 5.1  Deductive model independent variables and categories

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value (1-10)</th>
<th>Category</th>
<th>Weight</th>
<th>Weighted value (value x weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dist nearest populated area</td>
<td>10</td>
<td>0-1 km</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-5 km</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-10 km</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-40 km</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;40 km</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Road type</td>
<td>7</td>
<td>Primary</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tertiary</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Land use/Cover</td>
<td>6</td>
<td>Farm</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Light cover</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heavy cover</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Distance rd-grave</td>
<td>5</td>
<td>0-50 m</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50-100 m</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100-150 m</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150-200 m</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200-250 m</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250-500 m</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>
A brief discussion of category divisions and weights assigned to them is necessary to explain the reasoning behind them and thereby help make the model explanatory and repeatable:

a) **Distance Nearest Populated Area (variable value: 10)**

As it was deduced that killers would avoid killing very near populated areas, this variable was given the greatest value (10). Five categories were created to model the value of different distances from populated areas: 0-1 km (weight: 2); 1-5 km (weight: 7); 5-10 km (weight: 4); 10-40 km (weight: 3); and > 40 km (weight: 1). The high value of 1-5 km reflects the estimated distance that would be most desired by killers when selecting a kill site: not too near a populated area but also not very distant, which would be unnecessarily costly in terms of time and travel. The category >40 km was included to encompass the remote possibility that great distances would be travelled, but given the improbability it was given the lowest possible weight.

b) **Road Type (variable value: 7)**

The type of road along which victims were killed is likely a reflection of three primary considerations: that killings were generally conducted at night; that an objective was to terrorize and that killers acted with general impunity. For these reasons, it is hypothesized that killers would most likely kill their victims along primary roads (with respect to night-time killings, this would be the most obvious option given the near-certain difficulty of moving across lesser, probably dirt roads in the dark). Primary roads were given a value of 4. Secondary (value: 2) and tertiary roads (value: 1) may have been used when greater clandestinity was desired but were deduced to be of less appeal to the killers.
c) Land Use/Cover (variable value: 6)

Killer objectives included the elimination of perceived opposition (persons), the frustration of victim identification or judicial investigation as well as the terrorization of other locals. The combination of these considerations was primary in giving the variable value medium strength: 6. The sum of these objectives is believed to result in at most a semi-clandestine kill location (one which would frustrate identification but also terrorize via the discovery of bodies). Therefore farmed land, being the most likely place for bodies to be discovered quickly, was given a fairly high value (weight: 3); open locations, given that they are outside of populated areas, were deemed most likely disposal sites (weight: 4). Areas with partial coverage via sporadic trees, for example, would be an attractive alternative and so constituted a second category (weight: 2). The general impunity that surrounded the killings meant that disposing of bodies in heavily wooded or ‘hidden’ locations was not considered necessary and, furthermore, would generally work against the objective of terrorizing the local population except for the fear instilled by the disappearance of the victim. Nevertheless, the category was included to cover a broad range of possibilities and given a weight of 1.

d) Distance Road-Grave (variable value: 5)

With most killings taking place at night and transportation to the kill location by vehicle, those committing the killing run a risk of victims escaping with more time spent walking away from the vehicle from the side of the road, especially given the victims’ foreseeable impending execution. In addition, as general impunity existed for the killers (so long as they exercised some discretion regarding the killings), the need to move victims long distances from roads would have been considered an unnecessary expenditure of time and energy. Proximity to roads also served better the objective of
terrorizing (i.e., those who would pass by the next day would more likely see the bodies if they were closer to the road). Three categories were created to measure the distance from the road taking into consideration the lack of precision possible given the scale of maps used for modelling: 0-50 m; 50-100 m; 100-200 m; 200-250 m; and 250-500 m, weighted 7, 5, 4, 3, 2, and 1 respectively.

5.3.2.2 Deductive Model 2

After producing a suitability map for the first deductive model, the accuracy and precision were assessed. The same variables and values were used for the second deductive model but the category weights were adjusted in an attempt to refine the first model (see Chapter 6).

5.3.3 Predictive Map Creation

The last stage of data analysis for both the inductive and deductive predictive models is to produce a shaded contour map of predicted site presence probability (also called a “suitability map”). All map themes are converted to a raster format through ArcGIS and individual land parcels (unit of analysis) are given specific weights according to that calculated via the inductive and deductive model formulas using the Single Output Map Algebra tool (Spatial Analysts Tools => Map Algebra => Single Output Map Algebra). The values are then normalized so that each grid unit (30 m x 30 m land parcel) has a probability value lying between 0 and 1. These values are then divided into three equal groups to represent three probability ranges: high (0.67-1); medium (0.34-0.66); and low (0-0.33). These three groups are then colour-coded for display (red for high; yellow for medium; and blue for low). When visualized in the GIS a suitability
map displays areas of different value in terms of likelihood for grave presence based on their proximity to each of the different independent variables being tested.

Map layers created for the study area included primary, secondary and tertiary roads individually, to project probability based upon the deduced suitability of a location as a kill site along each of the different road types. Other map layers included were populated areas and one of the combined road network (primary, secondary and tertiary together) to project probability based on distance away from a road.

5.3.4 Model Evaluation

A critical stage of APM is model evaluation, through which both the accuracy and precision (i.e., utility) of the models are assessed. Accuracy refers to how often sites fit into high (and in some cases medium) probability zones and how seldom they occur in low probability zones. Precision refers to the proportion of a study area covered by a particular zone. There are many different tests of a model’s performance – in both the lab and the field – and each has its own requirements, strengths and limitations. Verhagen (2007:116) outlines three important concepts for predictive model testing:

Performance: the degree to which a model correctly predicts the presence or absence of sites;

Validation: the process of using data (sites) to test a model

Testing: using independent data (i.e., that not used for model development) to test the model.
Many researchers employ the use of a “hold-back”, “leave-one-out”, or test sample from the site data they used to create the model (Kohler and Parker 1986:430). For this study, however, the entire sample size of 47 was deemed necessary for model building, especially given the sample size requirements of logistic regression analysis. Although logistical regression-based models can be tested for accuracy using sites that were part of the model development, they are more appropriately tested with sites that are independent of the model (Warren and Asch 1990). To obtain a fairly robust sense of the utility of the models, three tests were employed: the survey statistic; the gain statistic; and the chi-square goodness-of-fit test. Following this, the projection of a new sample of sites was projected into the GIS to replace the original sample. These new sites in Spain were discovered during the analysis of the original sample data. How they fit in the predictive zones acted as a further test of model accuracy.

Field testing, via the excavation of test pits, is ideal for validity testing but is simply impractical or impossible in many contexts (van Leusen 1996). Adequately testing the models created here is highly unlikely for reasons mentioned previously such as the sensitive socio-political nature of the exhumations, lack of resources and the abundance of sites located (through past discovery and witness testimony) on private property.

5.3.4.1 The Survey Statistic

This test measures the percentage of sites discovered in the percentage of the study area that has been classified as having high, medium or low suitability, and is represented by the ratio “%Area:%Sites”. The test results in a ratio that indicates what percentage of the study area would have to be surveyed to locate a corresponding percentage of sites. For example, a survey statistic of 295:780 means that 29.5% of the
study area would have to be surveyed to discover 78% of the sites. The results are easily interpreted and represent a realistic picture of the reduced area over which sites will likely be found in a given suitability zone when comparing it with the entire study area.

### 5.3.4.2 Gain Statistic

The second method of model testing is the gain statistic (Kvamme 1988a, 1992), which measures how much increase a model gives in terms of percent correct predictions over a purely random model with no predictive capacity. For example, a model that performs no better than chance will score 0, whereas an efficient model will score close to 1. Using the gain statistic, the efficiency of the model and scored in a way that can be used to compare with other models. This statistic is calculated by:

\[
\text{Gain} = 1 - \left( \frac{p_a}{p_s} \right)
\]

Where:

- \( p_a \) = the area proportion of the zone of interest; and
- \( p_s \) = the proportion of sites found in the zone of interest.

Gain is normalized (scaled from zero to one), and the closer the gain score is to one, the more efficient the model. The gain statistic is calculated for: 1) sites used in the predictive model creation; and 2) sites discovered and excavated following those used to develop the models (see “New site sample”, below).
5.3.4.3 Chi-square Goodness-of-Fit Test

This test assesses significant differences between predictions for known sites with the non-site data. The known sites are the observed values and non-sites are the expected values as calculated by:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where O is the observed value, and E is the expected value. In this study, the proportion of sites (those used for model development plus the new, independent sample) in the low, medium and high zones will represent the observed values and the proportion of non-sites in each zone will represent the expected values (Ebert 2005).

5.3.4.4 New Site Sample

As this study was being conducted, sites in Spain continued to be discovered. Data from newly excavated sites that were of the same incident type (paseos) and in the study area would be used as an independent sample with which to test the validity of the inductive and deductive predictive maps.

5.4 Limitations

5.4.1 Maps and Population Data

Ebert (2000:132-134), in an effective critique of inductive modelling notes that what map data modellers use is typically a simple question of what digital data they can obtain and that automating analogue data (e.g., digitalizing paper maps): “is sometimes nearly as difficult as collecting one’s own ‘independent’ noncultural data, and few archaeologists have the time to do either”.
This study relied on data that had been digitized by others, and so has adopted any unknown inaccuracies that occurred during this process. It should be noted, however, that in the nine years that passed between Ebert’s critique and this study, the range and quality of available data have increased significantly and it is considered that the data used here are of acceptable precision and accuracy. This is particularly true with respect to the accuracy of site locations, which are now routinely marked with recreational GPS units.

The only map that could be acquired and used in this study to represent populated areas (hamlets, villages, towns and cities) used point data. This means that, with the maps having been rasterized into 30 m x 30 m pixels, each populated area would be represented as a single pixel of 30 metres squared. Even in the case of the smallest village this would be an underrepresentation. Nevertheless, the distances being calculated from detention centres to graves and the precision of the model is such that an underestimation of, say, 400 metres, is not regarded as very significant. In fact, given that many cases used for this study would have involved the victims being held in local jails of small towns, which are often incorporated into the offices of the municipality at the centre of town, this error could be close to nil. Using a centre-point of a populated area for spatial analysis would result in equivalent measurements and so this limitation, while having a potential effect on results, is viewed as being both inevitable and minor.

It is also apparent that the “Populated area” data are incomplete for two provinces: Burgos and Segovia (as seen by the fact that far fewer populated areas were indicated when compared with other provinces and this was confirmed through consultation with other maps). For this reason, non-sites in these two provinces that were not in places with marked populated data were removed so as to not skew distances measures. Only two
actual sites used in this study were in either of these two provinces (both in Burgos). Populated areas related to the detention and gravesites were either present in the available map or were added by myself after consulting other maps.

5.4.2 Population Density Data

There are three limitations inherent to the population density data: one of which relates to the use conditions of the data and two of which are related to the nature of the data. As these data came from a Web Map Server, they could not be downloaded and manipulated, only observed while online and connected to the server. For this reason, this variable could not be used for the creation of a predictive surface. This map also lacked metadata, which would indicate the proportion of the hundreds of municipalities in each of the eight population density zones (i.e., the scale). This information would have allowed for significance testing of the distribution of these sites relative to density. For this reason, only discrete, and not proportional figures can be calculated with respect to changes in density from origin to kill sites. The lack of metadata indicating the density range represented by each band makes tests using this data relative rather than absolute.

The final limitation of this density data is that they date to 34 years after the killings. In most cases, the relationship of densities is not likely to have changed over this time as several detention sites were located in cities or large towns, which will have persisted in being denser than their surroundings. An economic boom in the 1960s and 1970s triggered a population shift from more rural to urban areas that may be reflected in the demographic structure of the 1970 map, although the rate of internal migration in Spain remained low and relatively stable from 1931 until about 1961 (Romero Valiente 2004:212-217). If this demographic shift is reflected in the 1970 map, the changes from
1936 to 1970 would exaggerate the differences seen in population density relative to
travel by killers but would not change the nature of the movement according to the
changes reported in the study area prior to 1970. This is especially true considering that
most detention and gravesites were located in mid-range population density areas (the
middle three of seven bands).

5.4.3 Environmental Determinism

Inductive modelling has often been criticized for being environmentally
deterministic (e.g., Gaffney and van Leusen 1995; Verhagen et al. 2007:204, 205). In the
context of this study, this implies that complex human behaviour is essentially governed
by environmental factors to the exclusion of more multifaceted social, cultural and
psychological variables that are in many ways unique to an individual killer.

We know that to a degree individuals could and did influence the repression
during the Spanish Civil War. Armengou and Belis (2004:141-142) note how Nationalist
General Antonio Sagardía Ramos was vicious in his command of the “cleansing of the
towns”, whereas his comrade Commander Heli Rolando de Tella actively opposed
extrajudicial killings.

Although charges of environmental determinism in APM may have some validity,
such an accusation stems from the fact that modellers generally rely only on
environmental independent variables because they are the most reliable, available and
quantifiable data. There is a fear of misinterpreting or misrepresenting cultural variables,
which would then negatively affect the precision and accuracy of a model and negatively
affect one’s ability to judge how the model falls short of good prediction. Although
cultural variables may not be explicitly measured as such, reflections of cultural values as they relate to environmental variables are, and this probably explains why some predictive models have been quite successful. In this study, socio-political values are explored at length with an aim to model how these values are reflected spatially. As an example, the desire to avoid witnesses to killings results in kill sites that are a certain distance away from populated areas. The desire to terrorize resulted in victims being killed and left unburied close to roads. In this way, cultural variables are measured by analyzing kill sites in relation to environmental variables.

5.4.4 Environmental Data and Map Accuracy

There have been many criticisms of the use of modern landscapes as proxies for past ones in APM. This is a fair critique, but of much less relevance in the case of this study. Only 70 years have passed between the creation of clandestine burials and their excavation. In some instances graves had clearly been disturbed and there is good ethnographic and physical evidence to support the nature and degree of disturbance and landscape change, generally included in excavation reports. For example, an excavation by ARMH at Izagre-Albiros in 2008 identified a disturbed grave with articulated parts of at least two persons. The disturbance was explained as a result of a river that crossed through the grave. Locals testified that during the 1960s the area had been landscaped to accommodate farming, causing the river to change course (and cut through the grave) (Crespo Prieto 2008).

The greatest potential problem in this respect and for this study is with the change of the road network. For this reason, old maps from as close to 1936 (when the killings and burials occurred) as possible were cross-referenced to ensure that probable or certain
routes travelled in the past are the same as those marked on current digital maps used for modelling. In cases where new highways had been created where past roads did not exist, the past routes were used to calculate relevant variables such as “distance from origin/detention to grave”. In the same manner, “landuse/cover” was confirmed via the use of ethnographic testimony and maps from the time of grave creation.

5.4.5 Model Testing

Ebert (2002:92) asserts that the importance of field-testing of predictive models is paramount. Warren (1990:99) is less assertive, instead stating that field work should (my emphasis) be conducted on previously unsurveyed areas to test predictive models. Although field testing is the ideal form of establishing the validity and reliability of a predictive model, this is often impractical or even impossible for various reasons. Such reasons include obtaining permission for excavation of private property (where most victims are buried), a common obstacle for those investigating in Spain, (Macías pers comm. 2009) and the socio-political sensitivity of the work. Furthermore, field-testing by Ebert (2002) demonstrated several of the pitfalls of the method and how, if unrecognized, errors in testing or interpretation can lead to false confidence in the validity and/or precision of a model. Among the unforeseen challenges in Ebert’s study was the practical difficulty or impossibility of field testing areas such as cliff faces or those inundated by water (but not marked as such on maps used to plan test areas). Other studies, however, have shown that predictive models tested via methods other than field testing are useful and acceptable (e.g., Wescott and Kuiper 2000) until such time as field testing becomes more feasible.
6.0 Results

This chapter presents the results from the different analyses performed as outlined in Chapter 5. In some instances, limitations due to inadequacies of data forced an adaptation of the original methods. Any changes are described here and justification for the change and alternative method given. Three predictive models are presented: one inductive, which was created using data of known gravesites; and two deductive models, which were created by the reasoned weighting of different variables and categories but making no specific reference to the characteristics of known sites. For the three predictive models, the suitability map is presented and followed by a table summarizing the results. Following the tabulated information from the model, the results from each of the validation tests are presented: the survey statistic; the gain statistic and the chi-square goodness-of-fit test. An interpretation and detailed discussion of the significance of the results are in the following chapter.

6.1 Study Area and Sample

Although a sample derived from a single province or autonomous community would be ideal, a reliable, accurate and statistically adequate (for logistic regression) sample of data on grave excavations in a single area is unavailable. Although many Civil War graves have been excavated in the province of Burgos in particular, the nature of the killing and burial events varies among different types: paseos, sacas, battle casualties, and cemetery sites. Until each of these groups can be shown to demonstrate uniform
patterns within the event type, they should not be analyzed together as different factors are likely to have influenced the kill location decisions for different event types.

Three of the 47 sites originally selected for the study were removed from the sample: Milagros, Alfacar, and Faramontanos de Tabara. Descriptive and preliminary statistics showed the site of Milagros to be anomalous and a z-score was calculated at 5.60, confirming this. This was primarily due to the large number of victims (46) and the nature of the killing: a more organized *saca* from a central prison, rather than a smaller-scale *paseo*, which typically involved only a few people per event.

The case of Alfacar (also sometimes referred to in literature as near the town of Víznar, or “the grave of García Lorca”) is also a somewhat anomalous case. The local person who first dug the grave in 1936, (and who was not involved in the killings), indicated its location to a number of people several times in the decades following the killings. In 1986 a public park was created around the area in honour of poet García Lorca, one of the five victims allegedly buried in the grave. A worker turned up bones, (and subsequently re-buried them), during the installation of a fence around the park where the grave was alleged to be (Cortés 2009; Martín-Arroyo and Cortés 2009). In 2009, a local government-run prospection for the grave in a location about 150 meters away from the fence (another alleged location of the grave) revealed no subsurface disturbance. The case has been extremely controversial in Spain for various reasons and has become symbolic of the struggle for those advocating exhumation – in this case initially against the wishes of the family of García Lorca but at the request of the families of other victims in the same grave. When the present study began, it was anticipated that the grave would have been located by the time of writing. Although the location of the
site can be confidently said to exist or have existed in an area of about 400 x 200 meters, the site was removed from the study due to the lack of confirmed location.

Faramontanos de Tabara was the third site removed from the sample. The event surrounding the killings was unique by the fact that the victims (12, including one female) were transported first by train approximately 75 km before being loaded onto a truck, which drove a further 5.75 km to the kill site. Although scaling the travel by train, which could be considered less costly than travel by road (e.g., multiply by 0.75), could help make this event comparable with the others, it was decided to remove the case from the sample.

Data from the 44 remaining excavated gravesites were used to create the inductive model and to evaluate the inductive and deductive models. These sites cover a vast geographic range: 670 km west to east and 390 km north to south, across 15 (of 50) provinces and seven (of 13) autonomous communities (provinces are political units within autonomous communities). Despite this large span, slightly over half of the sites (24 out of 44) are spread across a distance of 270 km (west-east) by 135 km (north-south). Seventeen of the sample sites were in a single province, León, which is in the autonomous community of Castilla-Leon. The suitability maps created for all three models were restricted to the autonomous community of Castilla-Leon, where 27 sites, 61% of the sample, were located.

---

14 Thanks to Dr. Martin Andresen, of the Criminology Department at Simon Fraser University for this suggestion
6.2 Spatial Analysis

6.2.1 Spatial Autocorrelation

Univariate Moran’s I test was conducted to identify any spatial autocorrelation of the independent variables. If spatial autocorrelation exists, spatial statistics may be more appropriate than conventional statistics for analysis. Moran’s I test showed slight positive spatial autocorrelation (clustering) in three of the six independent variables tested: “# of victims”; “Towns crossed”; and “Distance travelled”. This means that the values were higher in certain areas resulting in an uneven spatial distribution of that variable across the study area. For example, with the “Towns crossed” variable, significant spatial autocorrelation indicates that more towns were crossed during travel to kill sites in some areas than in others. To verify this conclusion, p-values were derived, which showed the clustering to be statistically significant for the three variables. Table 6.1 below shows the results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Moran’s I value*</th>
<th>Significant</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td># of victims</td>
<td>0.1989</td>
<td>Yes</td>
<td>0.04</td>
</tr>
<tr>
<td>Cover</td>
<td>-0.0712</td>
<td>No</td>
<td>0.34</td>
</tr>
<tr>
<td>Road Type</td>
<td>0.1125</td>
<td>No</td>
<td>0.08</td>
</tr>
<tr>
<td>Towns crossed</td>
<td>0.2512</td>
<td>Yes</td>
<td>0.03</td>
</tr>
<tr>
<td>Nearest town</td>
<td>0.0858</td>
<td>No</td>
<td>0.10</td>
</tr>
<tr>
<td>Distance travelled</td>
<td>0.2543</td>
<td>Yes</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*Values range from -1 to +1, with -1 showing perfect dispersion, 0 showing a random spatial pattern and +1 showing perfect clustering/spatial autocorrelation.
As the use of spatial and conventional statistics depends on these results, I will briefly discuss them here. With the “Towns crossed” variable, it is probable that the clustering is on account of the atypically high density of populated areas around the city of Ponferrada (and also the nearby city Leon), where many of the sites from the sample are located. Data for half of the sites in this study came from ARMH, which is based in Ponferrada and which has done most of their work in this densely populated region. The positive spatial autocorrelation (clustering) of the variable “Towns crossed” is probably a reflection more the characteristics of the background environment than of a regionally unique spatial pattern of grave locations. A larger and more geographically diverse sample would likely clarify this. It should also be mentioned that significance for Moran’s I was determined if $p < 0.01$, which is a stricter standard that that used for other statistical tests.

Although the spatial autocorrelation detected for three variables causes some concern about the use of conventional statistics, Schwarz and Mount (2006:179) emphasize that the solution to a spatially dependent data set involves methodological and mathematical complexities and is still experimental. As noted in Section 5.2.5.1, the literature on archaeological predictive modelling makes almost no mention of authors testing for spatial autocorrelation, and authors disagree about the importance of it. Furthermore, Schwarz and Mount (2006:186) note that there is no spatial statistic equivalent to logistic regression (Schwarz and Mount 2006). For these reasons, it was decided that the proposed and standard use of logistic regression was acceptable until such time that spatial alternatives are readily available.
6.2.2 Univariate and Bivariate Tests of Variables

Using SPSS 17, histograms and descriptive statistics were generated to give a general first impression of the independent variables and their distributions. A non-site sample (N=97) was generated for univariate tests of ordinal, interval and ratio-level independent variables to test the null hypothesis of “no difference” between the sites and non-sites (i.e., test the normality of the distribution of “sites” variables). A table of the non-site variables and respective values is in Appendix E. Bivariate tests were conducted to test for significant correlations between independent variables. Significance was tested at the 0.05 level. Tables 6.2, 6.3, and 6.4 below list the variables tested, tests used, and the values derived from the tests.

As described in section 5.2.1.1., the different variables were defined as:

**# of victims**: how many victims were killed in each case;

**Distance travelled**: how far the killers travelled from the origin site (where the last victims were picked up) to the kill site;

**Land-use/cover**: the type of visual cover and land use at the kill site;

**Road side**: whether the kill site was on the same or the opposite side of the road in the direction being travelled;

**Road type**: if the kill site was off of a primary, secondary or tertiary road

**Distance last town**: the distance from the last populated area crossed, which in some cases was the origin, and the kill site;
**Distance next town**: the distance from the kill site to the next populated area in the direction of travel;

**Towns crossed**: the number of populated areas crossed during travel from the origin to the kill site;

**Female(s) amongst victims**: if one or more females were part of the victim group;

**Origin density**: the population density of the origin municipality

**Origin population**: the population of the origin town/city around the time of the killings

Several points are worth making based on considerations of the descriptive statistics in Table 6.2, below and observations of the values of independent variables. As the variables all showed positive skewness, the standard deviation of the median was calculated instead of the standard deviation of the mean. The number of victims represented by the cases suggests that the *paseos* studied here were relatively small events when contrasted with the larger scale *sacas*, which typically involved victims numbering into the twenties at a single time (i.e., in one night and from the same location) (Juliá 1999; Rilova Pérez 2001). The similarities of distances for the two variables “Distance next town” and “Distance last town” evidence by descriptive statistics suggest that graves were placed relatively equidistant between populated areas. The low mean, median, mode and standard deviation of the median for the variable
“Towns crossed” suggest that the killers generally avoided travelling through more than two populated areas when taking their victims from the origin point to the kill site. In 25 of 44 cases, the killers travelled through at least one other town (and as many as nine towns in one case) before stopping to kill their victims. In the cases where killers did not cross another town before killing their victims (19 of 44), the kill site was closer to the next town in 13 instances. In 38 of 44 cases, then, the kill site is farther from the origin town than another town.

All of these things strongly suggest a concerted effort to remove the victims from the origin town and kill them near another town, while also avoiding travelling too far. The distances travelled with victims and the relation of the kill site to towns around the origin suggest a small geographic range from the place of disappearance that is useful for investigations of victims of known origins.

Table 6.2  Descriptive statistics for continuous independent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev. Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td># of victims</td>
<td>1</td>
<td>16</td>
<td>6 (5.91)</td>
<td>5</td>
<td>1 (0.56)</td>
<td>5</td>
</tr>
<tr>
<td>Distance travelled</td>
<td>0.57</td>
<td>48.25</td>
<td>13.11</td>
<td>9</td>
<td>1.86</td>
<td></td>
</tr>
<tr>
<td>Distance next town</td>
<td>0.25</td>
<td>17.07</td>
<td>3.94</td>
<td>3.18</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Distance last town</td>
<td>0.35</td>
<td>13.72</td>
<td>3.45</td>
<td>1.91</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>Towns crossed</td>
<td>0</td>
<td>10</td>
<td>2 (1.75)</td>
<td>1</td>
<td>0 (0.35)</td>
<td>0</td>
</tr>
</tbody>
</table>

All distances in kilometres
Table 6.3  Univariate tests of significance for independent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistical test</th>
<th>Significant</th>
<th>Asymp. Sig.</th>
<th>z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road side</td>
<td>Chi-square</td>
<td>No</td>
<td>.170</td>
<td></td>
</tr>
<tr>
<td>Road type</td>
<td>Chi-square</td>
<td>No</td>
<td>.071</td>
<td></td>
</tr>
<tr>
<td>Land-use/cover</td>
<td>Chi-square*</td>
<td>Yes</td>
<td>.038</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(cross-tabulation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density change</td>
<td>Chi-square</td>
<td>Yes</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td># of victims</td>
<td>Mann-Whitney U*</td>
<td>Yes</td>
<td>.029</td>
<td>-2.182</td>
</tr>
<tr>
<td>Distance travelled</td>
<td>Mann-Whitney U*</td>
<td>Yes</td>
<td>.001</td>
<td>-3.392</td>
</tr>
<tr>
<td>Towns crossed</td>
<td>Mann-Whitney U*</td>
<td>Yes</td>
<td>.001</td>
<td>-3.423</td>
</tr>
<tr>
<td>Population density change</td>
<td>Mann-Whitney U*</td>
<td>No</td>
<td>.061</td>
<td>-1.872</td>
</tr>
</tbody>
</table>

*Comparing sites and randomly generated non-sites

For the univariate tests of nominal and ordinal variables, the chi-square test measured the difference of distribution between observed and expected values, except with “Land-use cover” where it compared distribution of the sites against the randomly generated 97 non-sites. The continuous variables were tested using the Mann-Whitney U test, comparing the distributions of known sites with those of randomly generated non-sites. Where statistical significance was detected, the null hypothesis of “no difference” between the distributions could be rejected. Histograms were created for the continuous
variables with abnormal distributions, showing that they were positively skewed. This confirms what is seen in the descriptive statistics: that killings were of small groups of victims, distances travelled were relatively short and that towns were seldom crossed during the journey from origin to kill sites.

Table 6.4  Bivariate tests of significance between independent variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Statistical test</th>
<th>Significant</th>
<th>Asymp. Sig. (2-tailed)</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td># of victims and Road type</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.607</td>
<td>.082</td>
</tr>
<tr>
<td># of victims and Land-use/cover*</td>
<td>Spearman’s rho</td>
<td>Yes</td>
<td>.046</td>
<td>-.302</td>
</tr>
<tr>
<td># of victims and Land-use/cover**</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.731</td>
<td>.037</td>
</tr>
<tr>
<td>Victim # and Distance travel</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.446</td>
<td>.118</td>
</tr>
<tr>
<td>Victim # and Towns crossed</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.697</td>
<td>.060</td>
</tr>
<tr>
<td>Origin density and degree of density change</td>
<td>Spearman’s rho</td>
<td>Yes</td>
<td>.000</td>
<td>-.760</td>
</tr>
<tr>
<td>Origin density and Distance travel</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.179</td>
<td>.206</td>
</tr>
<tr>
<td>Origin density and Land-use/cover</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.212</td>
<td>.192</td>
</tr>
<tr>
<td>Variables</td>
<td>Statistical test</td>
<td>Significant</td>
<td>Asymp. Sig. (2-tailed)</td>
<td>Correlation coefficient</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Origin density and Road type</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.999</td>
<td>.000</td>
</tr>
<tr>
<td>Origin population and Distance travel</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.090</td>
<td>.258</td>
</tr>
<tr>
<td>Origin population and Land-use/cover</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.773</td>
<td>.045</td>
</tr>
<tr>
<td>Origin population and Road type</td>
<td>Spearman’s rho</td>
<td>No</td>
<td>.095</td>
<td>.261</td>
</tr>
<tr>
<td>Female victim and Distance travelled†</td>
<td>Fisher’s Exact</td>
<td>No</td>
<td>.176 (Exact Sig., 2-sided)</td>
<td></td>
</tr>
<tr>
<td>Female victim and Cover/land-use‡</td>
<td>Fisher’s Exact</td>
<td>No</td>
<td>.173 (Exact Sig., 2-sided)</td>
<td></td>
</tr>
</tbody>
</table>

*Four Cover groups and three victim groups (1-2; 3-5; >=6)
**Two Cover groups (Tended land, untended land) and three victim groups (1-2; 3-5; >=6)
†Two Distance travelled groups (0-10 km; >10 km)
‡Two Cover groups (Tended land, untended land)

Looking at the results of the bivariate tests, only two of the tested relationships showed statistical significance. The correlation coefficient indicates the direction and magnitude of the relationship between the two variables. One of the statistically significant results suggests that there is a negative correlation between the number of victims and the degree of cover. In other words, the larger number of victims, the less cover there was at a kill site. An explanation of this is discussed in section 7.2 as it relates to hypothesis 1. The second statistically significant relationship demonstrates that the
highest population density origins showed less change during travel to kill sites than lower density origins. A plausible explanation for this is discussed in section 6.2.2.1. Importantly, the overall lack of significant bivariate relationships is a positive sign with respect to the potential problem of confounding influence of independent variables on grave location. The combined indication of non-random distributions established by the univariate tests and the lack of confounding influence as established by bivariate tests suggests an appropriate selection of independent variables for testing and confirms logistic regression as an acceptable test for the creation of the inductive model.

6.2.2.1 Population Density Change Relative to Origin and Kill Sites

A final analysis was conducted on the relative change in population density between origin sites and kill sites. The map to compare population density of origin with corresponding kill sites was from 1970 and showed colour-coded municipalities of Spain using eight bands to represent eight degrees of density. As mentioned in section 5.4.2, the numbers associated with each band is unknown.

Over 90% of the 44 sites studied here showed travel from a detention to a kill site in a less or equally dense municipality. Over half of the sites, 27 of the 44 (or 61%) showed travel to a less populated area. Only three sites (7%) showed travel to an area of greater population density. These three cases all showed a change of only one degree (i.e., one colour band, a relatively minor change).

In eight of the 44 cases (18%), the killers did not travel to a different municipality between detention and kill sites. Within these eight, demographic change can be seen on a micro-scale, with killers moving from populated areas (e.g., towns) to less populated
areas within the same municipality. Removing these eight cases from the sample, 75% of sites show travel to less dense areas, 17% across similarly dense areas, and 8% to denser municipalities (Table 6.5).

<table>
<thead>
<tr>
<th>Population density change</th>
<th>All sites (N=44)</th>
<th>Sites w/ travel to diff. municipality (N=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>61</td>
</tr>
<tr>
<td>Same</td>
<td>14</td>
<td>32</td>
</tr>
<tr>
<td>More</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

Clearly, there is a trend towards travel to less densely populated kill sites. These results led to the hypothesis that killers wanted to kill in less dense areas and that origins that were very densely populated would show greater change (decrease) than origins that were medium and low density. A test using Spearman’s rho showed a statistically significant correlation between density of origin and degree of density change (.000 with a correlation coefficient of -.760). Figure 6.1 shows a scatterplot demonstrating this relationship. A test of “Distance travelled” according to population density of origin showed no significant correlation, suggesting that killers did not travel further when starting from a high-density municipality. Nevertheless, in all of the cases that originated in high-density origins (those with populations greater than 5,000 people, N=10), killers
travelled outside the origin municipality to kill. Where origin and kill sites were in the same municipality, all cases had low density origins (i.e., the lowest three of the eight density bands).

Figure 6.1 Scatterplot showing correlation between population density at the origin site and the degree of density change to kill site

A chi-square test showed that the observed changes in density from origin to kill sites were significant. This conclusion, however, is limited by the fact that origin sites were all populated areas (e.g., cities and towns), so one can expect a drop in density with travel in any direction that leaves the municipality. A Mann-Whitney U test was
conducted to compare the density changes between sites and randomly generated non-sites. The result indicated that the null hypothesis of no difference between density changes of sites and non-sites could not be rejected, although it should be noted that the result was close to the cut-off (.061). A larger or different sample might produce a significant result. This test is also limited for the same reason as the chi-square test: the origins for non-sites, which were taken from the site origins, were populated areas. Although the various tests do not provide a conclusive answer to whether or not killers were intentionally moving to less densely populated areas to kill, the evidence suggests that this is so.

6.2.2.2 Data Not Conducive to the Creation of Suitability Maps

Several variables were demonstrated or deduced to affect grave location but could not be modelled due either to the form of data (e.g., map files incompatible with the modelling software) or the nature of the modelling process used. Population density change relative to sites was based on a map that could only be visualized but not manipulated. The maps are made available for viewing by the government of Spain through a remote server that is accessible using ArcGIS. Grave locations could be projected onto the density map, but the map could not be converted into raster format, which was necessary for the creation of the predictive models using the methods in this study.

Another example of a variable that could not be modelled was the Cover/land-use variable as observed from PDF maps. These maps were created by scanning paper maps from around the time of the Civil War (and may have dated to many years prior). It was decided not to model data in this format because digitizing these into a GIS-compatible
format would compound any error inherent in the original maps. In addition, to digitize these maps for the entire predictive modelling area of Castilla-Leon (94,220 km²) at a scale of 1:25,000 (the scale of the PDF maps) would be extremely laborious.

With this and other, similar variables (see table 6.6 below), it was decided that the observations from the univariate or bivariate analyses described above should be used for specific and directed grave searches rather than as part of the predictive models that projected general probability across the entire study area. In this sense, grave prospection is seen as a two-stage process: first the predictive surface is modelled for the general area based on variables for which reliable and available data exist for modelling (Stage 1). Then, results from other analyses are used to help assess the likelihood of grave location within high probability areas in the region of interest (Stage 2).

Although only certain variables could be modelled, some variables for which significance was detected (either through tests of randomness or bivariate tests of significant correlations) should be considered in both stages of investigation. Including and considering even the variables that cannot be modelled allows for their use in further studies if appropriate data (that which can be modelled) is located for a particular region or context. The following table illustrates: the variables that could be used for the creation of probability maps in this study; those that could only be considered in the second investigative stage; and those for which various aspects or relationships can be considered at both stages of investigation.
Table 6.6   Independent variables as recommended for consideration during stages of investigation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Used for predictive model (Stage 1)</th>
<th>Used as an investigative guide (Stage 2)</th>
<th>No significance detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victim #</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Distance travelled</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Land use/Cover</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Road side</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Road Type</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance last town*</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Distance next town*</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Towns crossed</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Distance road-grave</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Female(s) among victims</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Population density relative to sites</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

* Distances between the grave and the populated areas on either side of it were taken as a single variable in the predictive models: included as a population layer and the measurement of the *single* nearest populated area was modelled. These two variables should also be considered in the second investigative stage independently based on the results of the descriptive statistics.

As outlined in the methods chapter, various tests were used to validate the three predictive models. These included the survey statistic, the gain statistic, the chi-square goodness-of-fit test and a test using an independent sample of newly excavated graves that were not used for statistical testing or to create the inductive model. Since the time of
model development and testing in the Fall of 2009, I was able to obtain information for approximately ten more Civil War gravesites that had been excavated. Some of these did not conform to the incident type being studied here (i.e., they were of victims of large-scale sacas, cemetery burials or graves of battle casualties) and others fell outside of the area for which a probability map was produced. Five sites, however, met the criteria of the study and were used to test the probability models by plotting them onto the suitability map.

The following includes summaries of the data derived from each of the models and the results of each of the validation tests.

6.3 Inductive Model

The independent variables used to create the inductive model included each of primary, secondary and tertiary roads, distance from road, and distance from the nearest populated area. The analysis produced a suitability map with a range of values based on the ranked influence of independent variables according to logistic regression analysis.

6.3.1 Non-sites Created for Logistic Regression Analysis

One hundred non-sites were generated through ArcMap 9.3 (Data management tools => Feature Class => Create Random Points), with the autonomous region of Castilla-Leon as the constraining area. A minimum distance of 500 metres was set to ensure that two or more non-sites were not placed at or near the same locations. It was reasoned that 500 metres would be an appropriate minimum distance to change the values of the variables being measured for non-sites and thereby create a better comparison group for sites. From these 100, 17 were deleted for being close to actual gravesites. The
justification for this is because the random generation of points to serve as non-sites can produce false negatives. Therefore, some points are deleted that are a priori considered to be in places that are too similar to actual sites, which in this case were those within one kilometre of a known site. A third of the remaining 83 non-sites were deleted (every third case, leaving 55) to create a non-site sample comparable in number to the site sample. As population data appeared to be incomplete in two provinces (Burgos and Ávila), non-sites were removed from these two unless sites were in places where populated areas appeared to be accurately and completely mapped (generally along main roads). This reduced the non-site sample to 48, comparable to the site sample of 44 and appropriate for logistic regression analysis. Although in general terms a larger sample is better for statistical analyses, a larger non-site group can result in problems with the logistic regression algorithm causing it to predict non-sites better than sites (Wheatley and Gillings 2002:156). A larger number of non-sites also increases the risk of incorrectly labelling a non-site (i.e., a false negative) or putting a non-site in an area that has the same or very similar characteristics as a site.

6.3.2 Logistic Regression

Logistic regression was performed using SPSS 17 and produced beta values representing the influence of each independent variable according to its influence on gravesite location. These values, along with a constant (intercept) produced by logistic regression analysis, were combined into ArcMap using the raster calculator in the Spatial Analyst tool bar to produce the probability map. The formula with the beta values and constant was:
\[(\text{Distance to primary road} \times 0.0002952753) - (\text{Distance to secondary road} \times 0.0000433831) - (\text{Distance to tertiary road} \times 0.0000233906) + (\text{Distance to nearest populated area} \times 0.0000678544) - 0.480\]

Although normally the value range is divided into three, it was decided that a range of 9 (a multiple of three and so still allowing a division into three probability zones) better illustrated the different degrees of probability across the study area (see Figure 6.2). Values were symbolized using the quartile method in the properties tab of the map layer.
Figure 6.2 Inductive model suitability map for Castilla-Leon showing zones of high, medium, and low grave location suitability. Each zone is sub-divided into a further three zones. The inset at the bottom-left highlights the close-up in figure 6.3.
Below, figure 6.3 shows a closer view of a southwest section of the study area for the inductive model.

Figure 6.3  A larger-scale view of the suitability map produced by the inductive model in Castilla-Leon.
The following table shows a summary of the distribution in each probability zone of the number and proportion of cells (columns 1 and 2 respectively), graves used to create the model (column 4), newly discovered graves from the test sample (column 6) and non-sites (column 8):

<table>
<thead>
<tr>
<th>Suitability zone</th>
<th>Cells in zone</th>
<th>%</th>
<th>Graves %</th>
<th>New graves %</th>
<th>% Non-sites</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>582094</td>
<td>0.56</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>26481471</td>
<td>25.37</td>
<td>1</td>
<td>3.7</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>High</td>
<td>77332917</td>
<td>74.07</td>
<td>26</td>
<td>96.3</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>104396482</td>
<td>100</td>
<td>27</td>
<td>100</td>
<td>5</td>
<td>48</td>
</tr>
</tbody>
</table>

All but one of the known graves fall into the high suitability zone demonstrating a model with high accuracy. Unfortunately, over 80% of the non-sites also fall into the high suitability zone. Although the high rate of non-sites in the high probability zone suggests poor ability of the model to discriminate between sites and non-sites, it is important to note that the proportion of the study area covered by the high suitability zone is inordinately high (almost 75%). In other words, in creating a high suitability zone, the model has only reduced a very large study area by 25%.

Results from the three evaluation tests are reported below.
The first test of model performance is the survey statistic, (Table 6.8), which indicates what proportion of the study area would have to be surveyed to locate the graves lying in the high suitability zone. In this case, 74% of the study area would have to be surveyed to locate 97% of graves according to the sample used for model creation.

The gain statistic was calculated for the sites used to create the model, those from the new sample, and the two combined (Table 6.9):

<table>
<thead>
<tr>
<th></th>
<th>Original sample graves</th>
<th>New graves</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gain statistic</strong></td>
<td>0.23</td>
<td>0.26</td>
<td>0.24</td>
</tr>
</tbody>
</table>

The gain statistic indicates, on a scale of 0 to 1, how much better the model performs over chance. One would always expect a positive gain, although this is not guaranteed (Kvamme 1988b). In this study, the gain was positive, though low. The gain calculated for the independent sample was likewise low, though slightly higher than the sample used to create the model.

The final test of the model used is the Chi-square goodness-of-fit test (Table 6.10). In this application, the chi-square test examines the difference between the
proportions of sites and non-sites in each suitability zone. A significant result identifies sites and non-sites as being from distinct populations and indicates the model’s ability to discriminate between sites and non-sites. The following table shows the results of the chi-square analysis.

Table 6.10 Chi-square goodness-of-fit test, inductive model

<table>
<thead>
<tr>
<th>Chi-square</th>
<th>Df</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.0844</td>
<td>2</td>
<td>Yes (at 0.001)</td>
</tr>
</tbody>
</table>

Judging by the chi-square test, it is clear that the logistic regression formula has successfully discriminated between sites and non-sites. The previous two tests demonstrate, however, that the degree of difference is not well defined and that the model lacks precision as an investigative tool.

6.4 Deductive Model 1

Both deductive model suitability maps were made to project three zones of suitability for graves: high, medium and low.
Figure 6.4 The first deductive model grave suitability map showing three degrees of suitability in Castilla-Leon.

The tables and model evaluation tests below follow the same format as those for the inductive model.
Table 6.11  Summary of Results for the Deductive Predictive Model 1

<table>
<thead>
<tr>
<th>Suitability zone</th>
<th>Cells in zone</th>
<th>%</th>
<th>Graves</th>
<th>%</th>
<th>New graves</th>
<th>%</th>
<th>Non-sites</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1042641</td>
<td>6.98</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>20.8</td>
</tr>
<tr>
<td>Medium</td>
<td>5675420</td>
<td>37.98</td>
<td>9</td>
<td>33.3</td>
<td>1</td>
<td>20</td>
<td>34</td>
<td>70.8</td>
</tr>
<tr>
<td>High</td>
<td>8226371</td>
<td>55.05</td>
<td>18</td>
<td>66.6</td>
<td>4</td>
<td>80</td>
<td>4</td>
<td>8.3</td>
</tr>
<tr>
<td>Total</td>
<td>14944432</td>
<td>100</td>
<td>27</td>
<td>100</td>
<td>5</td>
<td>100</td>
<td>48</td>
<td>100</td>
</tr>
</tbody>
</table>

As with the inductive model, most graves (67%) fell within the high suitability zone. Several of the original sample graves in the high probability zone were less than a kilometre from the medium suitability zone based on their proximity to a populated area (e.g., Quintana de Rueda). This suggests that the hypothesized desirable distance judged by the killers was fairly acute. Had these sites fallen into a medium zone, one could conclude that the deduced desirable distance from populated areas was overestimated. Although the proportion of cells in the high suitability zone are less in this model compared to the inductive model, there is a corresponding decrease of graves located in this zone. Similar to the inductive model, the vast majority of cells in the study area (93%) and all of the graves fall into one of the medium and high suitability zones, so although the model is accurate, it is also imprecise.

The numbers in this table do show an encouraging sign: the proportions of sites and non-sites in the different zones are very distinct. Over 20% of the non-sites fall into
7% of the study area and over 90% of them are in the medium and low suitability zones (45% of the study area). Clearly the model is able to discriminate well between sites and non-sites.

Table 6.12  Survey Statistic for Deductive Model 1

<table>
<thead>
<tr>
<th></th>
<th>Original sample graves</th>
<th>New graves</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey statistic (% area:% sites)</td>
<td>0.55:0.67</td>
<td>0.55:0.80</td>
<td>0.55:0.69</td>
</tr>
</tbody>
</table>

The survey statistic for this model indicates that a survey of just over half of the study area would result in the discovery of two thirds of the graves. The statistic for the independent grave sample, however, performed better, suggesting that 80% of graves would be found in the high suitability zone. The more optimistic result should only be accepted cautiously given the small number of sites in the independent sample.

Table 6.13  Gain Statistic for Deductive Model 1

<table>
<thead>
<tr>
<th></th>
<th>Original sample graves</th>
<th>New graves</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain statistic</td>
<td>0.17</td>
<td>0.31</td>
<td>0.20</td>
</tr>
</tbody>
</table>

As with the survey statistic above, we see a discrepancy between the gain statistic scores of the original graves sample and the independent sample of graves. The former shows a very low score, suggesting the model adds little over a chance rate of locating graves. The new sample, however, suggests that the deductive model outperforms the inductive model. The most reliable picture probably comes from the combined figure,
which indicates that this deductive model does not perform as well as the inductive model, although both have low scores.

The chi-square test below, (Table 6.13), shows that the deduced values and parameters of this model enable very confident discrimination between the sites and non-sites. This test confirms contrasting site and non-site distributions according to the different suitability zones, as can also be seen in Table 6.11 above.

<table>
<thead>
<tr>
<th>Table 6.14</th>
<th>Chi-square goodness-of-fit test, deductive model 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chi-square</strong></td>
<td><strong>Df</strong></td>
</tr>
<tr>
<td>473.0836</td>
<td>2</td>
</tr>
</tbody>
</table>

The nature of the population data used for modelling, (point data), presents a problem as evidenced by the suitability map created by the deductive model (and also in the inductive model). With the study area cell size being set at 30 m x 30 m, the land parcel is a desirable size (i.e., small) but towns and cities that are mapped as points are projected at this same size (i.e., artificially small).

### 6.5 Deductive Model 2

With the aim of improving the precision of the first deductive model, several variable category values were changed to see if a map of greater precision but equal validity could be produced. To compensate for the small size of towns, a new category of “Distance from populated area” was created, 0 - 500 metres, and given a value of zero. This would basically stipulate that all populated areas be treated as 500 m x 500 m and...
that no value would be given to that area in terms of site probability. Further adjustments from the first deductive model included the following:

1. a category of 500 m – 1,000 m was given a low value of 1;

2. the 10,000 m – 40,000 m category value was reduced in value from three to one;

3. the > 40,000 m category value was changed from one to zero.

Although this model is labelled as deductive, it is the result of a series of decisions based on known (inductive) data and theoretical deductions. It was hoped that by identifying possible shortcomings in the above two models, parameters could be adjusted to create a model that outperforms both of them with respect to both accuracy and precision. As the accuracy of the above models was good, however, an increase in precision while maintaining the same or similar accuracy was desired.
Figure 6.5 The second deductive model suitability map, as reiterated from the first deductive model, showing three degrees of suitability in Castilla-Leon.
The table below shows the distribution of cells, graves, new graves and non-sites by suitability zone in the second deductive model.

<table>
<thead>
<tr>
<th>Suitability zone</th>
<th>Cells</th>
<th>%</th>
<th>Graves</th>
<th>%</th>
<th>New graves</th>
<th>%</th>
<th>Non-sites</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3534571</td>
<td>26.36</td>
<td>4</td>
<td>14.82</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>31.25</td>
</tr>
<tr>
<td>Medium</td>
<td>8469020</td>
<td>63.15</td>
<td>8</td>
<td>29.63</td>
<td>2</td>
<td>40</td>
<td>29</td>
<td>60.42</td>
</tr>
<tr>
<td>High</td>
<td>1407154</td>
<td>10.49</td>
<td>15</td>
<td>55.55</td>
<td>3</td>
<td>60</td>
<td>4</td>
<td>8.33</td>
</tr>
<tr>
<td>Total</td>
<td>13410745</td>
<td>100</td>
<td>27</td>
<td>100</td>
<td>5</td>
<td>100</td>
<td>48</td>
<td>100</td>
</tr>
</tbody>
</table>

The table demonstrates that precision of this model has improved over the previous two, with fewer cells falling into the high suitability zone. As with the other two models, the medium suitability zone continues to hold a large proportion of the study area cells, suggesting an inability to discriminate well between low and high suitability areas. The increased precision of this model appears to have come at the cost of accuracy, with over a quarter of the original gravesites falling into the low suitability zone. The differences in proportions between sites and non-sites are also roughly the same.
Table 6.16  Survey Statistic for Deductive Model 2

<table>
<thead>
<tr>
<th>Survey statistic (% area: % sites)</th>
<th>Original sample graves</th>
<th>New graves</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.11:0.56</td>
<td>0.11:0.60</td>
<td>0.11:0.56</td>
</tr>
</tbody>
</table>

The survey statistic suggests a fairly positive result from the model: surveying only 11% of the study area would reveal over half of the original graves and 60% of the graves from the independent sample. The precision of this model is greatly improved over the previous models but almost half of the graves have fallen out of the high suitability zone.

Table 6.17  Gain Statistic for Deductive Model 2

<table>
<thead>
<tr>
<th>Gain statistic</th>
<th>Original sample graves</th>
<th>New graves</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.81</td>
<td>0.83</td>
<td>0.81</td>
</tr>
</tbody>
</table>

The gain statistic also suggests a very positive result. The gain over chance of site discovery is clearly significant and much higher than that of the inductive and first deductive model values (0.24 and 0.20, respectively for the combined graves score).

Table 6.18  Chi-square goodness-of-fit test, deductive model 2

<table>
<thead>
<tr>
<th>Chi-square</th>
<th>df</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>301.0034</td>
<td>1</td>
<td>Yes (at 0.001)</td>
</tr>
</tbody>
</table>

As with the chi-square results from the previous examples, this model is able to effectively discriminate between sites and non-sites.
6.6 Data limitations

This study was limited by incomplete map data and a lack of information on excavated gravesites. In many cases, reports were never produced for grave excavations. In others, despite information existing, repeated requests by telephone and email went unanswered. Although over the course of study I was able to compile a database with information on more than 200 gravesites in Spain dating to the Civil War, some were only alleged and not confirmed, others did not conform to the incident type being studied here and excavation reports or detailed information other than a site name and nearest town were not available for many graves. All of these things attest to the complexity of the behaviour and phenomena of these killings and the graves in which the victims lie.

The quality of data used for this study certainly affected the quality of the models produced. As accuracy was considered paramount in the models, precision suffered. It is undoubted that with more data and that of higher quality such as land-use, more accurate population data (e.g., polygon instead of point data), and density maps that could be used for modelling, the models produced here could be refined and high suitability search areas reduced in size.

With respect to the models, the incompleteness of maps resulted in several shortcomings. Areas that would have been labelled as medium or high probability based on their proximity to roads were in fact ranked as lower probability because certain roads were not mapped. This is mitigated by the fact that the roads missing appear to be tertiary ones, which were seldom chosen by the killers when deciding on a kill site. The same, although inverse, effect occurred due to the incomplete mapping of populated areas notable in the provinces of Burgos and Ávila. In this instance, areas that were near
populated areas that had not been mapped would receive an artificially high probability ranking. Taking both of these things into account, it is suspected that the two incomplete features probably balance out and the proportions of the different suitability zones in the three models – and the subsequent evaluation test results – would likely be similar. Knowing that these data are only partial, however, demands that the suitability zones of the models be treated with caution where known roads and populated areas do not appear to be mapped until the models can be reiterated with complete data.

Despite the multiple lines of evidence discussed in Chapter 4 explaining how the behaviour of killings is rationalized, calculated and logical – suggestive of predictable patterns – it is clear that the behaviour of these killers is driven by multiple objectives and constraints. The more of these variables that can be modelled, the more likely one is to obtain a more accurate and precise idea of what those objectives and constraints are, as well as their relative influence and variability amongst different persons, groups, and regions over time.

The availability of excellent and increasingly inexpensive map data is increasing rapidly. At the data collection stage of my research I had been advised that maps in a certain format- that created by the Spanish government- were not compatible with the software I used in this study. At the time of writing, a little more than a year later, the government-produced data and the software used here are compatible (too late, unfortunately, to start my data collection and analysis over again). The quantity and quality of digital data, and software to accommodate and analyze it, are improving at a tremendous rate and this is favourable for the further development of forensic spatial analyses and modelling.
6.7 Summary of Results

A final sample of data from 44 excavated clandestine gravesites in Spain was used to develop and/or test three predictive models. Although these sites covered a vast geographic area, one third of them were from the single province of Leon and all sites either were within or clustered around the borders of the autonomous community of Castilla-Leon.

Univariate Moran’s I test was conducted to measure the independent variables for global spatial autocorrelation of the graves. Although three of six variables showed significant degrees of spatial autocorrelation, different authors have expressed doubt about the importance of such phenomena and a solution to clustering in this context is not readily available. Furthermore, the clustering of the variable “Towns crossed” is believed to reflect a bias in the sample more than distinct regional variation of variable values. As such, conventional statistics and logistic regression were employed as is consistent with previous studies and the majority of contemporary, published examples of archaeological predictive modelling.

Descriptive statistics showed several interesting trends that are of use to investigators although it is difficult to draw confident conclusions based on these basic measures. In general, killers do not travel far from the origin, they cross few towns and select kill sites that are not within sight of populated areas (especially considering that these events occurred at night).

Univariate statistics confirmed that almost all of the independent variables deduced to be related to kill site location decisions did not follow a random distribution. These suggest a pattern in the kill site locations and confirmed their use, if feasible, in the
creation of predictive models. The null hypothesis of “no difference from a random
distribution” for the variables “Road type” and “Road side” could not be rejected. The
variable “Road side” was expected to show that killers favoured the right-hand side of the
road. The majority of sites showed that the kill site was on the right side but the chi-
square value demonstrated that it the difference from a random distribution was not
significant (although it was close, at .071). As road type could have an influence on site
location as part of a multivariate analysis, it was included in the logistic regression
analysis for the production of the predictive models. Of the bivariate statistical tests
performed amongst the independent variables, “# of victims” and “Land-use/cover
showed a statistically significant correlation. Interestingly, this was a negative
correlation. The degree of population density change from origin to kill site also showed
a negative, statistically significant result, suggesting that the killers leaving the most
densely populated origins did not take their victims to a much less densely populated
area, when contrasted with travel from medium and low population density origins. The
variable “Population density change relative to sites” showed a significant trend towards
travel to less densely populated areas by killers en route to their crime.

Three predictive models were created: one inductive and two deductive. The first
two models showed that although they accurately predicted the location of known
gravesites, they did so very imprecisely. Although the models can be used with
confidence, they will not be of great use in identifying small areas of high probability for
grave location. The third model, which was a reiteration of the second deductive model,
was evaluated to perform much more precisely than the previous models. This precision,
however, came at the expense of accuracy and some known gravesites were incorrectly placed in the low suitability zone.

Several of the independent variables, either due to conceptual or data format/quality issues, could not be used to create and test the predictive models. Nonetheless, results from the univariate and bivariate statistical tests can be used to guide investigators when conducting searches for victims who are missing from known locations. Based on these tests and the results, a two-stage investigative process is advocated whereby predictive models are used to identify larger high suitability zones for grave location and then considerations are made of the variables that could not be modelled to identify the area within the high suitability zone where searches are most likely to be successful.

The following chapter will discuss the predictive models. The hypotheses presented in Chapter 4 will also be examined in relation to these results, with an overall aim of identifying specific aspects of killer behaviour as they affect kill site location decisions.
7.0 Discussion

This chapter reviews the goals and hypotheses of the study in light of the results of the analyses conducted. I begin the chapter with a review of the predictive models and their utility. Next, I discuss the hypotheses first proposed at the end of Chapter 4 and examine how the different statistical tests do, or do not, support the hypotheses. Following this, I propose a framework for the investigation of clandestine graves of victims of *paseos* in Spain. I finish the chapter with recommendations for future study on the subject of spatial analysis and predictive modelling of clandestine graves.

7.1 Discussion of Predictive Models

As with all predictive models, one strives to correctly classify all sites in the high suitability zone (i.e., be accurate) while also making that suitability zone very small (or precise). Three tests were used to evaluate the three models created in this study and an independent sample of graves (“New graves”) was included in the testing. The chi-square test demonstrated that all three models could effectively discriminate between sites and random non-sites. The other tests: the survey statistic and the gain statistic show the relative performance and utility of the models and enable one to compare them against each other.

The tables below present the results of the survey and gain statistics for the high suitability zones of all three models.
Table 7.1  Survey Statistic for High Suitability Zone of Models (% Area:%Sites)

<table>
<thead>
<tr>
<th>Model</th>
<th>Original sample graves</th>
<th>New graves</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductive Model</td>
<td>0.74:0.96</td>
<td>0.74:1</td>
<td>0.74:0.97</td>
</tr>
<tr>
<td>Deductive Model 1</td>
<td>0.55:0.67</td>
<td>0.55:0.8</td>
<td>0.55:0.69</td>
</tr>
<tr>
<td>Deductive Model 2</td>
<td>0.11:0.56</td>
<td>0.11:0.6</td>
<td>0.11:0.56</td>
</tr>
</tbody>
</table>

The proportion of the study area in the high suitability zone for each of the successive models decreases from the inductive to the second deductive model, demonstrating increasing precision. However, there is also a corresponding decrease in the proportion of sites classified in the high suitability zones. Although the inductive model is attractive for its ability to correctly place virtually all sites in the high suitability zone, the proportion of the study area that would need to be surveyed to locate them is simply not feasible. Comparing the second deductive model with the first, the decrease in sites found is only slightly more than 10% with the accompanying reduction of over 40% of the study area. The second deductive model is very attractive because of the greatly reduced area in the high suitability zone. The increased efficiency of the second deductive model over the first is the result of several minor changes, primarily the creation of a 500 m “buffer” around populated areas that was considered necessary to better represent the limits of populated areas that were represented as points (rather than polygons that would more realistically reflect the area of populated centres). A second adjustment decreased the values given to areas that were between 10 and 40 km from populated areas and those that were greater than 40 km from populated areas. These small
changes resulted in greater discriminating values that better reflected the distribution of known sites.

Based on the survey test, the second deductive model would be the most suitable for investigations. However, the shortcoming of the second deductive model – that of classifying almost half of the sites as medium or low suitability – makes it fairly unattractive. While the survey statistic provided useful information about what would be required of investigators and the proportion of graves they could expect to find, all three models have limitations by this measure.

Fortunately, the gain statistic helped distinguish the utility of each of the models. The results of the gain statistic for all models are in Table 7.2. The gain statistic measures how much increase a model gives in terms of percent correct predictions over a purely random model with no predictive capacity.

<table>
<thead>
<tr>
<th>Table 7.2 Gain Statistic for Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Original sample graves</strong></td>
</tr>
<tr>
<td>Inductive Model</td>
</tr>
<tr>
<td>Deductive Model 1</td>
</tr>
<tr>
<td>Deductive Model 2</td>
</tr>
</tbody>
</table>

The gain statistic provides a clearer picture of which model is preferable. Despite the inductive model appearing to be the least acceptable using the survey statistic, the
gain statistic scores it higher than the first deductive model. Neither of the two, however, scores high when we consider that the gain is not much greater than a random probability. The second deductive model, on the other hand, scores very well.

Comparing the different models, the high suitability zone covered the largest proportion of area for both the inductive and first deductive model, which is undesirable when one is looking for a precise area to which searches can be restricted. This proportion of area in the high suitability zone would be reduced significantly when one considers the problem of populated areas being represented as 30m x 30m points and that primary roads (which highly influence suitability for graves) cross the majority of populated areas. If a search were being conducted, the true limits of the populated area would obviously be dismissed even if classed as high probability knowing these limitations (unless the town or city had a cemetery within its confines and sound information existed suggesting the site was within or around the cemetery). In reality, then, the high probability zone is lower than suggested by these models although the data acquired for this study could not demonstrate this.

On the question of which is better, the inductive or deductive approach, it is important to reiterate that neither of them is strictly inductive or deductive as the names suggest (Verhagen 2007:14). The initial selection of independent variables for analysis and modelling was done deductively by considering which variables might logically have an effect on killer site selection choices. Soil type was not tested for several reasons that were pragmatic (e.g., the data were considered imprecise for these purposes and are reportedly unreliable), but also because it was deduced for several reasons to probably not be influential of kill site location decisions (see 5.2.1.1.f). There should be no doubt
that the inductive model performed poorly in this study because it failed to identify a reasonably small high suitability zone within which most kill sites would be found. Nevertheless, it is important to add that it could be improved fairly easily by reiteration with more complete data and by testing new independent variables (e.g., Bodies of water or Land Use/Cover from maps in an analyzable format), for their influence on kill site location selection. The first deductive model was designed after several months of working on graves in Spain and after several years of working on and thinking about similar contexts. Variables in the deductive model are therefore given discrete values and quantified through theoretical reasoning but are strongly informed by observation and conversation with colleagues. Finally, the second deductive model can be seen as a hybrid model, having been reiterated from the first deductive model and after months of studying the relationships of different variables. This fact demonstrates better than anything that both inductive and deductive (sensu lato) approaches are valid and that the best approach incorporates as much relevant information as can be obtained. In other words, using an approach that is informed by known sites but that also incorporates deduced ideas about killer behaviour results in the most effective modelling of kill site locations. This is why the second deductive model out-performed the other two models.

Gibson (2005, in Verhagen 2007:135) stated that a good model should have at least 70% of sites in less than or equal to ten percent of the study area, producing a gain statistic of at least 0.86. It should be noted, however, that a gain statistic of this value or higher is possible without meeting Gibson’s specific recommendation of the percentage of sites to percentage of study area. The inductive and first deductive models do not come close to this standard. The second deductive model approaches it, capturing 56% of sites.
in just over 10% of the study area, with a gain of 0.81. By the standards set by archaeological predictive modellers, the second deductive model is useful as a tool for locating clandestine Civil War graves in Spain.

7.1.1 Deductive Model 2 Sites in Low Suitability Zone

Although the different evaluations methods showed the second deductive model to be the most useful, there remains a concern about this model’s classification of four known gravesites in the low suitability zone. Close examination of the four sites shows that predictions were not very inaccurate, despite the suitability classification. All four of these sites are in the very populous area around Ponferrada. That there are many towns within a relatively small area resulted in most of the region being classified as medium and low probability.

The lack of high suitability space around Ponferrada appears not to have been enough to prevent the authorities from undertaking the same process of summarily shooting opponents that was underway throughout the rest of the Nationalist rearguard. In the minds of the killers in this region, the decision-making process involved answering if it was necessary to travel beyond the region – or alternatively go to a few very small and specific high probability zones – to kill their victims. In most cases, as high suitability was very uncommon in the area, killers chose to kill in the medium suitability zone. For the four cases in the low suitability zone, close examination of the suitability map shows that the sites are all less than 100 m from the medium or high suitability zones and in one case only 3.9 meters away (or about the length of a common grave). Some of this error is due to slightly miscalculated measurement or placement of the grave on the maps used for modelling: two graves near the town Magaz de Abajo were originally found and
excavated close to one another, but on opposite sides of the road. On the suitability map, they appear on the same side of the road and the grave that is further is that which lies in the low suitability zone. This case is an example of problems in grave placement according to reported coordinates and the different projection systems used by the person recording the data as well as problems related to the different layers of graves and road data used in this study. Despite these problems, all graves in the low suitability zone measure within 200 meters of a road, so the degree of “misclassification” is not serious.

7.1.2 Predictive Model Utility

Beyond the numerical results of model testing, the general overall utility and acceptability of the predictive models should be assessed. Almost all sites in the three models lie in the high and medium suitability areas combined but the area represented by these zones is no less than three quarters of the entire study area. None of these models is practically useful as a single investigative forensic tool. The ability of the models to discount areas, however, is quite useful. Investigators intuit probability during investigations but the models help quantify and assess the validity of such intuitions. The models, and particularly the second deductive model, can certainly help prioritize areas where clandestine graves are alleged to be. It can also identify high suitability areas in which investigators can lead a more effective search for witnesses (i.e., those who probably live close to a kill site). The importance of demonstrating areas of low suitability is essential for demonstrating to those that doubt the feasibility of grave searches. The initial prospect of graves being “anywhere” leads to the conclusion that searching for them will be a waste of time and energy. The suitability maps emphasize that the area in which graves likely lie is only a small proportion of the total area.
surrounding the place from which people went missing. In countries where governments are reticent about searching for the missing this can be critical.

The second deductive model would also be attractive from the standpoint of an investigator charged with finding evidence of large-scale crimes such as genocide or crimes against humanity. In such an instance a larger number of victims and a systematic pattern of killings serve as sound physical evidence of a coordinated effort to eliminate a large number of people. According to the survey statistic for this model, only 11% of the territory under investigation in this case would reveal over half of the victims. Other objectives such as a complete accounting of all of the missing, however, cannot be fulfilled solely through the use of a predictive model as created in this study.

A final question to be addressed here has less to do with the objective performance of the models and instead relates to the likelihood that the investigative community and those whom they serve will be willing to adopt predictive modelling of graves. First, it is important to remember that the risk of misclassifying a site in this context should be considered more serious than doing so for sites in a conventional archaeological context. I do not say this lightly and it is not meant to devalue our archaeological heritage. It is without question that we learn much about ourselves in the present when we discover and study our ancestors’ past biological development, social activities, customs, relationships with the environment and interpersonal relations. Investigations of missing persons who disappeared in living memory and often under circumstances of state or state-inspired violence, however, should be considered as exceptionally important.
So while standard measures suggest that the second deductive model is far superior to the others, we must also note that this model results in close to 10% of the sites being classified in low suitability zones. The risk of missing the grave of disappeared victims because of a miscalculation or misclassification is very serious. In this sense, the same measures of model performance that are used for conventional archaeological work may not be appropriate for the forensic context. When we consider which archaeological or forensic tools do have perfect precision, though, we see that predictive modelling is no different: the tool does not replace critical thinking.

Second, and related to the first point, predictive models are generally employed to guide archaeologists and developers in avoiding archaeological site destruction in the context of cultural resource management. The objective is to design construction projects to areas of lower archaeological potential knowing that if a site is discovered, it would be costly to halt construction while the site is documented and studied. Classifying areas of low suitability does not mean that they will be ignored in a CRM context and if a site is accidentally discovered during construction, the law (in many countries) mandates that the site be investigated and damage mitigated. Even for archaeological predictive models that are designed for site prospection rather than avoidance, failure to discover a site using a predictive model is simply disappointing and might also be considered a waste of money, but one can never be certain that a site ever existed in the area.

For investigations of missing persons, and especially those where resources are particularly few, the assignment of low suitability may mean that the area will never be searched. When the goal is to discover, rather than to avoid, the high suitability zone will naturally be the centre of work and the low suitability zone will almost certainly be
dismissed. This has serious repercussions in the investigation of missing people, especially when the probability of a site existing is almost certain: the person is missing and must be somewhere (although the possibility of the remains having been completely destroyed through taphonomic processes does exist, rarely would one expect this in a forensic timeframe: Spain being a somewhat exceptional case given the long passage of time). Complete reliance on such a model could indeed lead to the expedited discovery and identification of many victims but could also lead to the relegation of the remaining graves to a class that is “beyond the pale”.

Modelling and quantifying such problems obviously carries some risk and stands a good chance of being rejected outright by the population that one is endeavouring to assist, despite impressive model performance. The problems that might result are not those of the models themselves but how we represent the models. Models must not be seen or advocated as providing simple and definitive answers but as a tool that assists and helps direct investigation.

The development of the models in this study has accomplished several things that have not been done before in Spain or, to my knowledge, in more than a single other context, described in Chapter 2, where graves are being sought as part of investigations of missing persons (and in this single instance there is no evidence that any use was made of the model). The models developed here have quantified the problem and provided a platform from which further models can be developed and refined. The models also tell us that the criteria being modelled go some way towards understanding the modus operandi of the killers when selecting a kill site. From this, investigators can know that other, untested variables are influential in kill site location decisions. Some of these
variables, despite not having been modelled, are evident in other statistical analyses and observations. These will be discussed in greater depth in the section below, which examines the results of different tests and the models with respect to the hypotheses formed on patterns of graves in Spain.

7.2 Assessment of the Hypotheses

In this section, the hypotheses presented in Chapter 4 are examined to see if the results of this study support them. It is important to emphasize that decisions about the validity of the hypotheses here are qualitative and that the predictive models do not lend themselves to hypothesis testing in the same way that statistical tests allow for quite definitive acceptance or rejection of a hypothesis. For this reason, as many measures of the validity of the hypothesis that are available are examined and if insufficient evidence exists to accept a hypothesis, it is rejected. The primary purpose of these hypotheses is to better understand the behaviour and thinking that influence kill site location selection and, ultimately, to assess the validity of the main hypothesis of patterning in kill site locations.

The main hypothesis around which this study rests, posits:

The locations of clandestine graves of those killed by Nationalist rearguard paramilitary in the first months of the Spanish Civil War are patterned. They share several common spatial characteristics that make their location amenable to predictive spatial modelling.

This hypothesis can be answered by taking into account the results of the several secondary hypotheses below. If these latter hypotheses are demonstrated to be valid, one
can readily accept the main hypothesis of spatial patterns for grave locations that can be usefully modelled in the search for missing persons.

Hypothesis 1 states that:

Despite the general impunity of the killers, they actively avoided possibility of witnesses to rearguard extrajudicial executions of civilians.

There were various ways for killers to avoid witnesses to the killings including shooting the victims within or behind cemetery walls (cemeteries generally being outside of towns\(^{15}\), or more likely by taking them out of populated areas and doing so at night. Different tests performed address this hypothesis. The simplest measure was that of the distance of grave locations between towns. Descriptive statistics showed that the minimum distance of a kill site from a town was 250 meters and the median values – the data were positively skewed – about 2-3 km (1.9 km from the last town passed and 3.18 km to the next town down the road). The median distance travelled between origin and grave location was 9 km. The standard deviation of the median for distance travelled was 1.86 km, showing a consistent pattern. All these values strongly suggests that killers wanted to remove victims well away from the origin and from populated areas before killing them.

The literature on the Nationalist repression overwhelmingly repeats the fact that most *paseos* occurred at night. Of the 44 sites used in this study, information about the time of day of the killings was obtained for 23 and in all cases the killings are reported to

\(^{15}\) Roman cemeteries were generally placed outside towns for sanitary reasons and this continued as a justification for their location at least through the 18\(^{th}\) Century (Calatrava 1991; Toynbee 1982:48).
have taken place in the evening or at night. Distance measures should be considered with respect to this fact. Travelling at night by the killers is less secure (especially during a civil war) and the chance of people being out at night to witness the killings is greatly reduced.

The decrease in population density between origin and kill sites is very indicative of a desire to kill victims in places where witnesses are less likely. In 27 of the 44 cases in this study, killers took their victims to lower density municipalities to kill them. Fourteen cases showed no change in density between origin and kill sites, although in six of these cases killers travelled to a different municipality and the density levels for these cases was never high. In the remaining three of 44 instances, where killers travelled to a more densely populated municipality, they were only one degree of density higher and still to a municipality of medium or low density. In one of these three cases, the municipality in the direction opposite to that travelled was denser than either the origin or the kill location, thus killers removed them from the origin to the less dense of the two neighbouring municipalities.

Various statistical tests demonstrated that there was a definite overall decrease in population density from origin to kill sites. Whether or not this was partially or largely an artifact of the origins being towns and cities (and so naturally more densely populated than their immediate surroundings), could not be discerned.

The Land-use/cover variable initially seems to contradict this hypothesis. The second most common category of kill site, open farmland, represented over a third of the sample and is the least covert category. Two considerations must be made with respect to this variable. The first is that because the killings were conducted at night the killers may
have wanted open area for reasons of security, especially with larger groups of victims. Most victims probably knew or suspected they were being taken to be killed. The possibility of frantic victims escaping would be greatly reduced in an open area. The most common category of kill site cover was the third of four ranks of increasing cover (“light cover”). Although this category included areas of low brush, it consisted mostly of orchards and vineyards. It is believed that these areas, along with those in farmland, were chosen as kill sites to accomplish the second of the two killer objectives: to terrorize. Killing at night and outside of populated areas allowed for the elimination of opposition (killer objective 1) without witnesses. Killing victims on land that was cultivated practically ensured the discovery of the bodies, thus serving as a terroristic warning to those who might consider resisting the rebel authorities. Even in cases where victims were killed at cemeteries, which were not considered in this study, the possibility of witnesses being present at night during the war would be remote.

All of these things taken into consideration allow the hypothesis to be accepted. Although in most cases no effort was made to hide victim bodies, (in fact, the opposite is true), killers chose unpopulated locations to kill. Had there been no fear of witnesses, killings could have been committed far more efficiently and the objective of terrorism could have been far better served, by shooting victims at the cemetery of the victim origin during the day. The cautiousness demonstrated by killers despite their impunity demonstrates the political balance that was sought with respect to targeted killings of civilians in civil war as described by Kalyvas and as discussed in Chapter 4. Not having full political control of an area and population given the on-going war and uncertain loyalties of people, the authorities (in this case also the killers) chose to kill at night and
without witnesses, leaving responsibility for the killings implied rather than explicit. This allowed the authorities to disavow responsibility and avoid provoking members of the population defecting to the other side of the conflict.

Hypothesis 2 states that:

*Victim identification will affect the degree of clandestinity of the killing site: the more socio-politically sensitive the victim, the more clandestine the kill location*

One of the major challenges during the design of this study was establishing the activity to be analyzed. Although over 100,000 non-combatants were killed by the Nationalists during and after the war, many of these were buried in marked or unmarked graves in proper cemeteries. How killers made the decisions to kill at cemeteries or not is unclear but it is believed that the decision was based in part on the justifiability of the killing. That is to say, it was easier for the authorities to defend the public shooting of those who were overtly opposing to them, such as prisoners-of-war. A greater assertion of authority and an example of the punishment due to those who actively defied the authorities would be made through more overt executions at cemeteries. Other victims who posed a less obvious threat to the Nationalists, appear to have been killed more often in rural and clandestine locations. Although this dissertation only studied non-cemetery burials, it was thought that trends in victim characteristics for non-cemetery sites could be indicative of who was in turn killed more publicly, at cemeteries.

Tests that were expected to address this hypothesis included those measuring clandestinity related to graves with female victims. There were only five sites in this
study’s sample with female victims. Fisher’s Exact test was used to test female victim graves against degree of land-use/cover and distance travelled. Both of these tests showed no significant correlation. Road type did not meet the data requirements to be tested statistically against female victims given the small sample size. Despite the ability of Fisher’s Exact test to produce a result, the small sample size is of concern and the results, which suggest that female victims did not influence killer decisions, should not be accepted as a definitive conclusion. A larger sample would provide results that are more meaningful and possibly reveal significant correlations.

Information on victim identifications in this study’s sample show that there were often people of various associations within the same victim group: teachers, union leaders, labourers of no union or political affiliation, Republican town councillors, etc. Many cases in the literature also demonstrate contradictory evidence regarding victim identification and clandestinity of kill site. Although hundreds were shot at a city cemetery in Granada, hundreds were also driven almost 10 kilometres outside the city to be killed and buried in anonymous mass graves, including famed poet Federico Garcia Lorca (Gibson 1973). Another of those allegedly in the same grave as Garcia Lorca was Dióscoro Galindo, a secular primary school teacher with an artificial leg (Gibson 1973; Webster 2007:79). Both of these victims might be considered socio-politically sensitive and so their killing warranted greater clandestinity, but they were also buried with two anarchists who had demanded the local government distribute arms to people to help resist the Nationalist rebels (Webster 2007:79). Amparo Barayon, a faithful Catholic, but also wife (through a civil ceremony) of a Republican writer, was killed in a cemetery in Zamora (Sender Barayon 2003).
These cases illustrate the complexity of victim identities and how even if these criteria are used to help determine kill site location, we may still not be able to define how the killers perceived the victims. It may be that the polarization that occurs in civil war, as discussed in Chapter 4 and making reference to Waller (2007), Kalyvas (2006) and Graham (2005), resulted in many killers perceiving their victims as belonging simply to a single group: enemies. Differences in burial places may not relate to victim identification at all, but rather Nationalist policy over time, decisions by local authorities or whim of the driver in the vehicle transporting the victims. Insufficient data were acquired in this study to accept or reject the hypothesis that victim identity determined the degree of clandestinity of kill sites and it is believed that this hypothesis may be too difficult to effectively test.

Hypothesis 3 states that:

The number of victims will affect the degree of clandestinity of the killing site. Killers expect a stronger negative reaction by the local public to large-scale killings and so will go to greater lengths to obscure them.

As with the tests for female victims and grave clandestinity, three ways of making a kill site more clandestine were posited: the site could be farther in distance from the origin; it could be in an area of a greater degree of cover; and it could be along a lesser (e.g., tertiary) road. Another possible measure could be the number of towns crossed, with more towns crossed signifying the same as a longer distance travelled. In the case of bodies being several towns away from their origin, the municipality that would hold
responsibility for the investigation or disposition of the dead would be well removed from the town from which the victims came.

Statistical tests of the association of number of victims with road type, distance travelled and towns crossed all failed to show a significant correlation. The only variable that demonstrated a correlation with the number of victims was land-use/cover and the correlation was negative. That is, the larger the number of victims, the less ground cover there was at the kill site.

Several factors should be considered when judging the results of these tests. The first is that logistics may have played an influential role in the killings and particularly those with larger numbers of victims. Although greater travel distances may have been desired by killers, they in fact went as far with large victim groups as with small ones despite increased cost of travel: more vehicles are needed (or at least larger ones), more persons are required to operate the vehicles and guard the victims against escape during the journey to the kill site. Furthermore, if avoiding witnesses was desired as the first hypothesis showed, then shorter distances may have been more discrete with larger groups. That no significant difference in distance travelled was demonstrated may actually support this hypothesis given the greater cost of detaining, transporting and killing larger victim groups.

In a similar way, the significant result of a negative correlation between victim number and degree of cover may have a pragmatic explanation. As mentioned in the discussion of hypothesis 1, greater control would be required over a larger victim group and so the killers may have chosen sites with low cover for larger groups for fear of victims escaping. Even if this explanation is valid, however, to claim that a desire to go to
areas of cover existed but was outweighed by security concerns is conjecture and not
grounds for accepting the hypothesis. Although there is some evidence that this
hypothesis may be valid the evidence is insufficiently clear and so the hypothesis should
be rejected.

Hypothesis 4 states that:

*The more rural the origin site, the less clandestine the kill site will be.*

The rationale behind this hypothesis is that in more rural areas the authorities have
less to fear in terms of backlash from the public for the killings. Kalyvas’ arguments
discussed in this work make it clear that targeted killings of civilians are calculated acts
and the degree of killing reflects the degree of control the authorities have over an area.
Smaller towns are easier to control than large cities because the potential field of resisters
to the authorities is greatly reduced. Therefore, more overt (i.e., less clandestine) acts of
killing in rural areas will more effectively terrorize and there is the accompanying lower
risk of invoking organized opposition.

To address this hypothesis, population density of the origin municipality and
population of the origin towns were tested against the three measures of clandestinity
used for the previous hypotheses: longer distance travelled; land-use/cover; and road
type. None of these tests showed statistically significant relationships and the hypothesis
should be rejected.
Hypothesis 5 states that:

*Victims were killed closer to a town that was not the town where they had been detained.*

*Kill site selection by this criterion would frustrate potential identification efforts by killing the victims in a foreign (albeit local) political and legal jurisdiction*

Although killers were acting with general impunity, they have been shown to make an effort to avoid witnesses and, this hypothesis argues, frustrate any attempt to investigate the deaths of their victims. It is believed that individuals were intentionally killed in a jurisdiction that is not the one from which they originated. Although there were other ways to prevent identifications such as burning the bodies, this proved costly (see Chapters 3 and 4) and so simply killing victims in another jurisdiction may have been deemed by the killers as sufficient to prevent victim identification and negative repercussions for the killings.

Evidence that addresses this hypothesis comes from the first-hand account of Vilaplana (1977) as discussed in Section 4.2.4 about the political constraints of killers. Initially, Vilaplana claims that the fear of the Nationalist authorities was such that neither family members of the deceased nor legal investigators made any concerted effort to identify victims. This means that the killers had little incentive to frustrate identifications as their terrorism precluded any serious threat to bring them to justice. As there is no evidence to date that these killings were formally mandated (e.g., in writing), the question of impunity of the killers should be considered to have been implied. As such, killers were having to define the degree of clandestinity warranted in light of the knowledge that although what they were doing was – in their own minds – somewhat justified, it was still criminal and morally wrong as well as socio-politically sensitive. Chapter 4 of this study
shows ample evidence of the rationalization process that killers use to justify the killings but at the same time they are acting and thinking rationally and they recognize that shooting civilians without a trial is a questionable form of justice.

Further evidence comes from the province of Soria (Herrero Balsa and Hernández García 1984), also discussed in section 4.2.4. The town of Lubia took responsibility for burial of victims, who had originated mostly from Sigüenza, several towns to the south. The kill sites were about equidistant to Lubia and the larger city to the south, Almazán, but it was the farther town of Lubia that took responsibility for collecting and burying the victims. The decisions implicit in the selection of kill site and body disposal at more distant locations were made despite the previously mentioned costs of doing so: of risking greater numbers of witnesses during the journey to crime, of personnel and vehicles required, and of travelling at night. Had there been complete and implicit impunity, the easiest way to dispose of victims would have been to shoot the victims at the local cemetery, or even in the town square. Although many victims of extra-judicial killings were shot at cemeteries, the ones from this study and thousands of others were not. Killers often made an effort to hide the killings and one measure of doing so was to prevent the victims from being identified. A more effective terrorization technique may have been public shooting of locals but as Kalyvas notes and as discussed in Chapter 4, eliminating opposition, terrorizing potential opposition and maintaining a position of authority requires a calculated socio-political balance.

These cases are supported by the evidence in this study, particularly the values of the variables “Towns crossed” and “Distance last town”/”Distance next town”. In 25 of 44 cases the killers travelled through at least one other town (and as many as nine towns
in one case) before stopping to kill their victims. Although the mode for this variable was zero, the median value was one (Figure 7.1). In the cases where killers did not cross another town before killing their victims (19 of 44), the kill site was closer to the next town in 13 instances. In 38 of 44 cases, then, the kill site is farther from the origin town than another town.

![Number of Towns Crossed on Trip to Kill Site](image)

Figure 7.1   Boxplot showing the number of towns crossed by killers on the trip from the origin site to the kill site.

It is also illustrative that the distribution of distance travelled in this sample is positively skewed, showing killers preferred not to travel far from the origin. Despite normally travelling only short distances, the killers travelled beyond another town and into another municipality as demonstrated here and in the analyses of population density.
If one observes the distances from kill sites relative to populated areas it is clear that killers were not travelling far while at the same time sought to kill outside of populated areas (Figure 7.2). These observations taken into consideration with the fact that in most cases a town was crossed during the journey to the kill site strongly suggests that killers purposively selected kill sites that were beyond the jurisdiction of the origin town, a significant finding of this research.

Figure 7.2  Graph showing distances of populated areas before and after kill sites. Each horizontal line represents a site and the line’s length represents total distance between the towns before and after a kill site. Sites have been arranged from shortest (top) to longest (bottom) distance. Three sites were removed for not having a populated area beyond the kill site (e.g., a dead end road). The vertical red lines represent the mean distance of all sites with respect to distance of town before (left line) and town after (right line) kill sites.
There are three cases, however, which seem to contradict this hypothesis and line of reasoning, where the kill site was within 700 metres of the origin: the killing and burial of a single victim in Parrillas and two killings in Murrillo de Gallego (of 12 and 16 victims). In the neighbouring, (though together fairly remote), towns of Parrillas and Navalcan, there have been three Civil War graves excavated from three distinct killing events. Although all the dates of killings are not precise, it appears that the last killing shows the least distance travelled (700 metres, and down a tertiary road towards a river). This last of the three killings also involved only a single victim, whereas there were two and three victims for the other cases where further distances were travelled. These cases may demonstrate a local evolution in killings over time: with greater establishment of authority (and fewer “enemies” to kill or opponents to appease), less effort was made to hide the killings. In the cases of Murrillo de Gallego, the exception to this hypothesis may be because of the origin being very low density (2 on the scale of 1 to 8, and the second least dense area of the 44 cases). The nearest town in the direction of one case was over eight kilometres away (the other site was along a tertiary road in the direction of a river). In both of these cases, victims were taken from various towns, only the last of which was Murrillo de Gallego. Therefore, many of the victims were actually taken to a town beyond their origin and only the locals were killed close to their origin. There are therefore logical explanations for these exceptional cases, but they also emphasize the variability that exists with respect to grave locations of the victims of paseos.

---

16 The actual number of victims from Murrillo de Gallego is not known to this author, though according to press reports three of the group of 16 were locals and at least two of the group of 12. Repeated requests for more information from the archaeologist who led the excavations went unanswered.
The evidence above suggests that the hypothesis is true, although the strength of the evidence, being either anecdotal or inferential, is not great. Documentary or witness testimony mandating the removal of victims to other jurisdictions would obviously strengthen the confidence with which this hypothesis is, based on this study, tentatively accepted.

The main hypothesis that the thesis endeavoured to answer states that:

*The location of clandestine graves of those killed by Nationalist rearguard paramilitary in the first months of the Spanish Civil War are patterned. They share several common spatial characteristics that lend their location to predictive spatial modelling."

Although the evidence is not unanimous, the data and analysis in this study strongly support this thesis. There was sufficient evidence to accept that Nationalist rearguard killers were actively avoiding witnesses to killings. Likewise, killers were taking their victims to foreign municipal jurisdictions to shoot them. Other hypotheses, relating to victim numbers, identifications or patterns unique to rural versus more populated areas all failed to show positive correlations.

Observations of the three predictive models show that to differing degrees all were able to discriminate sites from non-sites confirming what many of the univariate tests of independent variables showed: that kill site locations are not randomly placed. Interestingly, despite scoring low in the conventional predictive model tests, the first deductive model showed the greatest discrimination between sites and non-sites. The second deductive model, despite scoring very high in the gain statistic, showed very poor discrimination between sites and non-sites. It should also be considered that one cannot expect perfect discrimination between sites and non-sites as the latter represent a random
generation across the study area. Although 17 of 100 non-sites were initially eliminated for lying near known gravesites, there are more that lie in high suitability areas and there may even be some very close to yet undiscovered graves. The precision of the models was lacking and more data should be acquired to substantiate and refine the models.

Thus, although the predictive models all have limitations, both individually and together they undoubtedly demonstrate patterns of gravesite locations. Some of these patterns have been identified in this study, while others remain unknown. The challenge for investigators is to take what is known and use it to guide them in searches for further graves. With each new discovery, and subsequent analysis, the tools that can be used to facilitate discovery become more refined and effective. The models and tests refer only to one incident type, *paseos*, were only developed from cases in the Nationalist rearguard and mostly from the first five months of the Spanish Civil War. These patterns may extend beyond this incident type, temporal framework and to the other party in the conflict but this requires testing (see Future Study, below).

### 7.3 Investigative Recommendations Based on Identified Patterns

The aim of this study was to identify patterns of killer behaviour to facilitate the search for further graves of the victims. Several protocols exist for the investigation of missing persons from the Spanish Civil War and for grave excavations including that by Etxeberría (2003), the government of the Autonomous Region of Aragón (Gobierno de Aragón, nd), and those of the nongovernmental organizations *Foro por la Memoria* (nd) and ARMH (in process). The recommendations here are based on analyses of kill site locations and unlike the above protocols do not discuss technical methods of scene analysis, documentation or grave excavation. These recommendations are designed to
assist searches for missing persons from specific origin points and should be used as a supplement to existing investigation protocols.

It is important to emphasize that the analyses conducted in this study represent only one of many complementary methods that can assist grave prospection methods. These guidelines are based on spatial analysis and predictive modelling and by highlighting a higher probability area for focussed search can enable the more effective search for witnesses as well and the use of geophysical or other remote sensing methods. The ultimate method of grave location is excavation.

Prior to being able to employ the results of this study’s work, one must identify the incident type that resulted in a disappeared person or disappeared persons. One must ensure that there is little or no possibility that the victims were interred in the/a local cemetery. This should be done by examining cemetery and local government and church registries (to include both religious and civil burial sites) but it is equally, if not more important to conduct directed questioning of locals. Reference should also be made to similar cases in the region from the same temporal context (e.g., consult local and regional historians and relevant publications), to see if there are obvious trends or patterns in the local area. It should also be noted that due to time passed since the disappearances, current cemeteries may not coincide with those that existed and were in use at the time of the killings being investigated.

In many instances, victims are rumoured to have been “transferred” to a more centralized detention centre. Presumptions about their arrival at the next detention centre might be confirmed by prison documentation. Although there is little guarantee that their entrance into the facility was registered, both the date and details of entry and exit were
commonly documented at formal prisons as has been demonstrated by many historians of the repression, including when the prisoners were being released to be taken out and shot (e.g., Rilova Pérez 2001). This situation exemplifies the form of killing called the *saca*.

If neither of the above two conditions appear to explain the location of the victims, their disappearance as a result of a *paseo* is much more certain and the following guidelines can be used to search for the victim grave in a two-stage investigative process. The reason for dividing the guidelines into two stages is because of the two types of analyses conducted in this study as a result of limitations of certain variables that could not be modelled. The suitability surfaces have been generated taking into account road types, distances from roads and distances from populated areas. Other variables were analyzed using univariate and bivariate tests of statistical significance and descriptive statistics.

The first stage of these guidelines uses the suitability map from Deductive Model 2 and involves identifying all high suitability area around the origin town from which victims were taken. The second stage considers information that could not be modelled and involves creating two prioritized probability areas, labelled “a” and “b” according to higher and lower probability respectively (within the high suitability areas). Probability area “a” includes 67% of the cases from the study sample according to the values of the independent variables that could not be modelled. Probability area “b” includes 95% of the cases according to the values of the independent variables. As the independent variables used for this second investigative stage demonstrated strong positive skewness, the cases considered for each of the probability areas were taken around the median. Independent variables considered here include “Distance travelled”; “Towns crossed”;
“Distance last town”; “Distance next town”; “Land-use/cover”; and “Population density”.

All sites can be expected to be within 200 metres of a road, although most will be within 100 meters.

Stage 1

Examine the Deductive Model 2 suitability map and identify the high suitability area within 50 km of the origin site. Stage 2 will take place entirely within this high suitability area.

Stage 2 (Within the high suitability zone from Stage 1)

Higher probability area “a”

1. Distances within 14.5 kilometres of the origin;

2. Along roadways between the origin and the next two towns in all directions;

3. Areas between 350 meters and 3.12 kilometres of all towns passed in the direction of travel (assuming no other towns are crossed);

4. Areas between 4 kilometres and 250 metres of all towns being approached in the direction of travel (assuming no other towns are crossed);

5. Property that was farmed at the time of victim disappearance (orchards, vineyards and fields);

6. Municipalities with a lower degree of population density than the origin.
**Lower probability area “b”**

1. Distances within 36.15 km of the origin;

2. Along roadways between the next two six towns in all directions;

3. Areas between 250 metres and nine kilometres of the last town passed in the direction of travel (assuming no other towns are crossed);

4. Areas between 12.3 and 350 metres of all towns being approached in the direction of travel (assuming no other towns are crossed);

5. Areas of all but very heavy cover at the time of victim disappearance;

6. Municipalities with population density equal to or less than the origin.

If sites are not found within these areas, there are several possibilities that should be considered in order to continue investigation. The first possibility is that the grave is actually within the area but has not been located. There is little that can be done about this except to repeat the steps above or turn to other methods of prospection. The second possibility is that the kill site is within the medium suitability zone, which is much larger than the high suitability zone. Stage 2 can be repeated within the medium suitability zone if investigators are quite certain that the site is not within the high suitability zone. The medium suitability zone according to the second deductive model covers about 65% of the entire study area and so investigators should be prepared to commit substantial resources if undertaking this search. Obviously the probability is greater of the kill site being in areas of medium suitability that are close to the high suitability zone. A third possibility that could explain the absence of a kill site from the above parameters is that it
is in the low suitability zone or greater than 45 km from the origin. A final possibility exists that the remains were never buried and all physical trace of the victims has disappeared. Although this may be true, physical evidence of the bodies would almost certainly have been present for many years (e.g., scattered bones) and persons living in the area around the origin site should be able to attest to such evidence had it existed.

7.4 Future Study

Despite the controversy of Spanish Civil War grave excavations, they are continuing under the direction of victim families and nongovernmental organizations. The amount being published on the Spanish Civil War and repression, particularly by Spanish historians, has increased exponentially over the past two decades paralleling grave excavations. New and more detailed information is constantly becoming available, including that immediately relevant to studies such as this one.

There are many directions of research that could develop the specific ideas of this study and facilitate grave discovery. I discuss a few of these below, although the subjects addressed in each sub-section are not mutually exclusive. The effectiveness of the models in this study could be re-evaluated using data from more sites, something that could probably be usefully done in a couple of years. Nevertheless, the increasing availability of good quality maps, spatial software and spatial statistics would make the reformulation of models a better idea if one wanted to facilitate grave discovery rather than simply test the effectiveness of the models developed in this study. As Dalla Bona (1994b) has emphasized, predictive modelling should be seen as an iterative process. More specific information that would enhance modelling include specifics related to victim and
perpetrator identifications, temporal and regional patterns of killings and graves, and technical and methodological variations of spatial analysis and predictive modelling.

7.4.1 Influence of Victim and Perpetrator Identities

Victim groups in this study generally consisted of persons of various affiliations and associations in the same grave (e.g., leftist politicians, anarchists, family members of Republican soldiers). The data acquired for this study was not refined enough to be able to test for correlations between individual and group victim identifications with kill site locations. As more data become available, trends may become clearer showing that there was differential treatment accorded to, for example, members of different trade unions such as the UGT (Unión General de Trabajadores, the socialist labour union) and the more leftist CNT (Confederación Nacional de Trabajo, the anarcho-syndicalist labour union)\textsuperscript{17}.

This thesis cited various authors as claiming that the different paramilitary groups such as the Falange and the seemingly more disciplined and organized Carlists or Guardia Civil, treated detainees differently. In the same way that victim groups often included people of various associations, some reports for sites used in this study claimed members of various groups were responsible for a single killing event (e.g., members of the Falange and the Civil Guard). Despite the broadly agreed-upon responsibility for most rearguard killings being assigned to the Falange, Vilaplana (1977) claims that in Burgos they acted quite responsibly, punishing and even killing their own members who were responsible for paseos. This anomaly in the behaviour of Falange members may relate to

\textsuperscript{17} Brenan (1960:335) produced a map showing trade union membership by region that, although general, may help form the basis of this line of study.
the fact that Burgos was the capital of the Nationalists in the north. The military and paramilitary pecking order, more centralized command or even the more organized methods of the regional commander, General Mola, may have affected how different groups and individuals behaved with respect to the “enemy”.

Differences in kill site location may also be shown to depend on whether or not the killers were locals: did they personally know the victims and were they familiar with the local geography and landscape and if so, how did that affect their selection of kill sites? There are obviously many different directions in which this line of inquiry can be taken but they all require more specific and directed data than that acquired for this study.

7.4.2 Temporal Aspects

On a smaller scale, seasonal differences in kill site location decisions may be useful. The weather, particularly in northern Spain, may have influenced the cost of travel during the journey to kill sites (e.g., due to rain or snow).

As identified by this and other studies, the repression in Spain evolved throughout the war. For this reason I have posited that modelling of gravesites should be done according to the period or phase of the repression. This will also be unique to various regions according to the local degree of conflict and established authority throughout the war. Future work could examine and model gravesites from the periods not studied here, such as the formalized executions that took place during the latter stages of the war and post-war. These killings resulted in tens of thousands of victims. Even at the micro site-level, late- and post-war prisoners who were executed were typically buried in unmarked graves albeit outside prisons. Modelling the sequence of their burials within a site could
demonstrate a temporal order of burial and contribute to presumptive identifications with knowledge of named prisoners and the dates of their execution.

Temporal changes in kill site location decisions may reflect the degree of authority held by killers, as suggested by Kalyvas (2006) and discussed earlier. Rilova Pérez (2001:173) claims that those who were buried in mass graves in the cemetery in Burgos were those who had been judged in summary trials but also those killed in the first days of the rebellion. On July 16th, 1936 the Nationalist authorities were confident their coup would succeed and so killings were overtly conducted at cemeteries. As it became clear the coup was not succeeding, there was contention over who held legitimate authority in Spain and the targeted killing of civilians became more clandestine. All but two of the cases of *paseos* analyzed in this study date between July 31st and December 3rd, 1936. As mentioned Chapter 4, General Franco began a consolidation of power over the militias in the winter of 1936 and spring of 1937. These apparent temporal shifts in kill site locations reflect security of authority and, seemingly, subsequent policy decisions by the Nationalist authorities.

**7.4.3 Influence of Other Places, Attractors**

“Attractors” is a concept routinely employed in environmental criminology (Brantingham and Brantingham 1995). What features of a landscape make it attractive to those wanting to commit crimes? The challenge of logistics where widespread killings are taking place probably answers much of this. The decision to kill and dispose of victims at wells and bridges is very common in the literature on the Spanish Civil War repression (e.g., Herrero Balsa and Hernández Garcia 1984; Zavala 2006) and this is probably because they both facilitate easy body disposal. The challenge of distinguishing
event types also relates to this category as cemeteries were common kill sites, for unsurprising reasons. Why cemeteries were unattractive in thousands of instances, however, is not known.

The re-use of kill sites is a phenomenon that is apparent in a few instances of *paseos*, but a much more common trend among *sacas*. A series of excavated graves in Burgos from the area of Lerma and also those mentioned previously in La Rioja suggest that once a precedent grave is established, the location attracts further killings. Thus, kill site location for *sacas* may be influenced by the previous placement of a similar grave from the same or similar origin (a comparable effect to that evident in the study by Reddick [2006] on Bosnian graves as discussed in Chapter 2). An alternative explanation implies a single advance decision by those responsible for transporting and killing victims to use the same site over time (rather than making a decision about the kill location with each killing event). There may be different legal consequences for these distinctions as a decision to kill and dispose in the same location over time implies advance planning, knowledge of previous killings, and a coordinated, sustained effort, all of which suggest organized crimes of a greater scale than just isolated events of multiple murders.

### 7.4.4 Event Types

A prima facie look at *sacas* suggests that they differ significantly from *paseos* mostly by the number of victims. It is strongly suspected, however, that other variables distinguish the two events and result in different spatial patterns related to kill location decisions. It is suspected that due to the logistical challenges of *sacas*, of transporting and killing larger numbers of people, distances travelled may be shorter. Greater implied
complicity of higher authorities (given that prisoners are being taken directly from centralized prisons), also suggests certain impunity and so the killers are less likely to travel far.

Another possible distinction in incident type might be discernible with the so-called “traslados”, or “transfers”. In these cases, prisoners were allegedly being taken from one detention area to another, rather than being taken out to be shot. These victims often ended up being shot along the way to the new detention place. It is not known if the transfer of detainees was merely a euphemistic guise for the fact that the intention was to take them out to be killed or if a decision to kill was made en route. The case of Toral de Merayo in this study appears to conform to this event type as the victims were taken from a small city of just over 2,000 people, driven more than 25 km and then killed 8 km from the large city of Ponferrada (population 12,000), where there were centralized detention centres. There may also be detectable differences depending on whether the victims were killed along the way to the new detention site or after they had arrived, but were turned away because of a lack of space. The definition and distinction of these event types, however, requires more detailed information and research.

7.4.5 Technical and Methodological Considerations

There is promise in the recent development of new, different and experimental statistical methods (e.g., spatial regression, in Schwarz and Mount 2006:179; Bayesian statistics in Verhagen 2007). These methods may prove to overcome the limitations of logistic regression, which continues to be the most popular tool in archaeological predictive modelling. This being said, there is an inherent danger in advocating more advanced statistical methods. As Schwarz and Mount (2006:185) note: “the peril is that
archaeologists, as investigators who are generally untrained in the use of these complex statistical tools, will adopt a shotgun approach that will introduce problems of suitability and interpretation” (also Verhagen 2007:16). This argument is not new to archaeology (e.g., Hole 1980), and so while statistics and quantitative measures should continue to be taught and studied by archaeologists, we must also acknowledge our limitations and defer to true experts when we find ourselves breaching the limits of our own expertise. Likewise, the more complex a solution becomes, the less likely it is to be adopted in large-scale investigations that typically operate with very limited budgets, personnel and foresight.

Multicriteria analysis (or MCA, also: multicriteria evaluation or MCDM, multicriteria decision making) is likely to be of use in modelling grave locations. MCA is a formalized method of defining, quantifying and modelling decisions by considering objectives and constraints of decision-makers (Carver 1991; Malczewski 1999). MCA has been applied to a limited extent on archaeological contexts (Krist Jr. 2006; Verhagen 2006, 2007). MCA was also considered as a method for this study but IDRISI software was necessary and it was considered that the development of predictive models using two different platforms (IDRISI and ArcGIS as used here) would make them difficult to compare.\footnote{Thanks to Dr. David Ebert for this advice}

\textbf{7.4.6 Spatial Frameworks}

In the same way that temporal considerations warrant greater attention, geographic trends are likely to reveal specifics about the nature of the repression that were not observed from the data used in this study. The repression in Andalusia, in the
south of Spain, appears to have been fairly different from that in the north and identifying the causes for this will help locate the missing.

Vilaplana (1977) is one of several authors who note differences in regions as a possible explanation of the degree of repression. This relates in part to the identification of places according to the people who live in them. Vilaplana reports that the cities of León and Valladolid strongly sided with the Nationalists uprising and were known for embracing traditional values, but also that their proximity to the front and the strength of unions and labourers amongst the populations made them dangerous places (p. 138-155). Kalyvas’ theories may provide explanations for the degree and form of targeted killings in such front-line regions that distinguish them from other areas where there is less or different types of threats to the authorities.

This same point could – and, I would argue, should – be extended beyond Spain. One of the overarching arguments made in this current study was that the behaviour of targeted killings of civilians in times of armed conflict is patterned. Examining international trends would greatly assist the increasing investigation of war crimes, crimes against humanity, genocide and that of disappeared persons in different countries. Publications on the Spanish Civil War repression frequently make comparative reference to Nazi crimes, and particularly those of the Einsatzgruppen who were responsible for “cleaning up” in the rearguard of newly taken territory prior to and during the Second World War (e.g., Pons Prades 2006:33; Reig Tapia 2006:525, 526). Such comparisons between the Nationalists and Nazis are more easily made given the direct military and political links during the Spanish Civil War and Second World War. Further comparisons of, for example, the Nationalist repression in Spain and political violence in Latin
America in the 1970s and 1980s (e.g., Carmelia Bruno 2008; Moreno Gómez 1988:311) also carry some weight, particularly considering the strong cultural and political ties between Spain and Latin America. Additionally, the end of the Franco regime roughly coincided with the peak of much of the violence in the Americas, which could suggest a shift of influence by former leaders in the Franco military and government from their own country to the former colonies in the Americas. Rodrigo (2008:51) notes that Pinochet held great respect for Franco, and it is easy to draw comparisons in their chosen forms of repression. Comparisons between Spain and other countries such as Bosnia, however, may prove less salient despite similar social situations and dynamics.

Until such issues are studied, however, we have only anecdote and theory. Cross-cultural or international patterns may reveal more than just political and cultural connections but also surprising insights into universals of human cognition and behaviour.

7.4.7 Model Testing

The importance of field testing predictive models was discussed in Section 5.4.5. Authors on archaeological predictive modelling disagree about the necessity of field testing, but there is general agreement amongst authors that different suitability areas identified by predictive models should be tested by excavation. Until the Spanish government decides to accept responsibility for investigations of missing persons from the Spanish Civil War, there will be great limitations on resources available for the work. The current possibility of even limited resources being directed towards field-testing a PhD thesis (let alone other forms of academic research) is nil.
The continued work by nongovernmental groups serves as the closest thing to field-testing, as excavations continue across various parts of Spain. Acquiring an adequate sample of reports of these excavations (both failed and successful) to confirm locations and which suitability zone sites are in would require another couple of years. Nevertheless, research that is funded privately and through sources other than the Spanish government, such as this study, may serve as catalysts for further predictive model design and testing, continued grave discovery and victim identification and repatriation.

7.5 Conclusion to Discussion

Human behaviour is remarkably complex and in many ways impossible to fully understand, let alone model and predict. Nevertheless, analysis of different variables, frameworks and periods of time may allow us to draw reliable conclusions about the dynamics, motivations and constraints that result in patterned behaviour according to the various circumstances. This study considered it vital to impose necessary limits on the scope of the behaviour being studied so as to identify trends and generalize within a limited context. It is naive to think that the selective murder of civilians, even of one side of an armed conflict, is consistent across time and geographic space given all of the other social and political changes and adaptations that are occurring, which have a confounding influence on the killings. This study demonstrates, however, that within a smaller and well-defined framework, behavioural patterns are identifiable, quantifiable and predictable.

The implications of such patterns are open to interpretation. To suppose that the patterns are evidence of a coordinated and organized repression is logical and arguable. However, this presumption discounts the possibility that the patterns may be attributable
simply to common behavioural traits. Even that the killers are actively conscious of their choices is a presumption, although given the rational nature of their behaviour this is a fair conclusion. Discerning between coordinated planning and coincidence of human behaviour could affect prosecutorial decisions, as mentioned in Section 7.4.3.

The primary utility of this study is in the identification and quantification of behavioural patterns of selective, political violence, which is a recurring human phenomenon across time and place. The spatial study and prediction of clandestine burial sites of victims holds great potential for application in other contexts, which it is hoped will work towards ending impunity of perpetrators, acting as a deterrent to future crimes, bringing justice to victims, their families and their communities.
8.0 Conclusions

Most of the 114,000 non-combatants killed by the Nationalists during and following the Spanish Civil War lie in unmarked mass graves across the country. The Spanish government has not accepted its responsibility under international law to investigate these crimes of enforced disappearance. Victim families and their supporters have directed the search for the missing, uncovering over 4,000 victims since the year 2000. The goal of this study was to assist these people with the search for the graves by identifying spatial patterns of grave locations.

8.1 Thesis rationale

The rationale of this study is based on the work of political scientist Stathis Kalyvas (2003, 2006) and social psychologist James Waller (2007), both of whom have studied systematic and violent killings of non-combatants, particularly during armed civil conflict. Both authors demonstrate that in this context, those who selectively kill civilians behave rationally. The work of Waller and Kalyvas is substantiated by dozens of examples from many authors who witnessed or have studied killings of civilians by the rearguard during the Spanish Civil War. Because of the rationality exercised by killers, we need only understand the objectives and the constraints that guided their decisions to be able to effectively predict where they took their victims to shoot them, and where the victims most likely remain buried in unmarked graves.
8.2 Methods and Results

The objectives of this study included spatial analysis and predictive modelling using both deductive (theory-driven) and inductive (data-driven) approaches. Any patterns identified using these methods could be used to predict kill site locations in support of investigations of missing persons in Spain.

Grave location was treated as the dependent variable. Data from forty-four excavated graves of victims of extrajudicial killings were analyzed. Several independent variables were deduced to influence grave location: Number of victims; Distance travelled between origin and kill site; Distance from the last town passed during the trip to the kill site; Distance to the nearest town beyond the kill site; Number of towns crossed between the origin and kill site; Road side of the kill site; Nearest road type (primary, secondary, tertiary); Land-use/degree of cover at the kill site; and Population densities of origin and kill sites. Descriptive statistics provided a geographic range of activity within which killers operated, showing that killers typically shot their victims less than 13 km from the origin and they avoided taking victims through populated areas before killing them.

Independent variables were tested to see if they showed spatial autocorrelation, which would determine if conventional or spatial statistics should be used. Moran’s I test showed little spatial autocorrelation amongst the independent variables tested, and so conventional statistics were used for analysis. A random sample of 97 “non-sites” was created across the study area to serve as a comparative group for certain statistical tests. Univariate statistics were calculated for the independent variables to test the null hypothesis of random distribution. The null hypothesis was rejected, confirming non-
random patterns of kill sites, for the variables: Land-use/cover; Population density change; Number of victims; Distance travelled; and Towns crossed.

Bivariate tests were conducted to identify any co-variation of the independent variables. Only Land-use/cover and Number of victims had a significant, and negative, relationship suggesting that more victims were killed at areas that were farmed rather than forested or other heavy cover locations. This was explained as a result of logistical and security concerns by the killers but also as a desire to terrorize the local population, which would be sure to discover the executed bodies at low cover farmland, vineyards or orchards. Various tests of population density change suggested that killers intentionally took their victims to foreign municipalities and to less populated areas before killing them. This demonstrates a deliberate attempt by the killers to avoid witnesses to the shootings and frustrate any possible investigation into the killings. This information is particularly useful to investigators of missing persons, suggesting that information pertaining to the location of victim burial places is more likely to be found in the archives of neighbouring municipalities. In the cases of this present study killers were paramilitary and operated with virtual impunity. However, the statistical tests showed that their impunity was implied, rather than explicit and that socio-political considerations lead them to act somewhat discretely about where they chose to kill.

Only the variables Road type, Distance of kill site from road, and Distance to the nearest populated area could be used for the predictive models. One inductive (data-driven) model was created using logistic regression analysis. A deductive model, based on theoretical assumptions about killer objectives and constraints and that are reflected in the independent variables, was also created. A second deductive model was created by
adjusting the parameters of the variables of the deductive model: reducing the value of areas very close to or very far from populated areas. The models were used to produce suitability maps for the study area of the autonomous community of Castilla-Leon (Spain), where most of the sites from the sample were located and where thousands of people remain missing. The suitability maps identified areas of high, medium and low suitability for graves. Both the inductive and first deductive models accurately classified virtually all of the known sites into high and medium suitability zones. In both of these models, however, these two zones covered the vast majority of the entire study area, which is of little use to those who are trying to reduce the areas that they would have to search to locate graves. The second deductive model reduced the high suitability zone to just over 10% of the study area and captured over half of all known sites, showing that it was a much more efficient model. A few known sites, however, were located in the low suitability zone of the second deductive model showing that greater efficiency came at the cost of accuracy. All of the models showed different weaknesses, but the second deductive model demonstrated strong potential as a useful tool in the investigation of missing persons and clandestine graves in Spain.

Sufficient evidence existed to accept two of five sub-hypotheses. The first demonstrated that killers chose kill sites that decreased the probability of witnesses to killings. The second showed that sites were chosen in a way that would decrease the probability of victim identification and investigation of their deaths. This study showed that despite various limitations related to data availability and quality, even simple statistical measurements can identify trends in clandestine grave locations. The results of the analyses performed and the predictive models confirmed kill sites were patterned and
that the geographic range of kill sites from Spanish Civil War rearguard killings could be effectively predicted to assist with the search for missing victims.

The results of the statistically significant relationships and the predictive modelling were used to propose a two-stage guideline for investigations in Spain. To the knowledge of this author, no such analysis and investigative guide has ever been created for this purpose in Spain or elsewhere. This study examined a specific type of killing, the *paseo*, and only those that did not result in victims being killed and buried at a cemetery. For this reason, the guidelines should only be considered useful for investigating the same type of killing event until further study demonstrates the patterns evident in other types of killings. The first stage of the guidelines references a high suitability zone, as identified by the second deductive predictive model, which lies around the place of origin of a disappeared person or persons. The predictive modelling methodology could only account for certain variables due to methodological and data limitations, but useful information gained from the analysis of other variables should be considered when searching for kill sites. The second stage uses results from the analysis of variables that could not be modelled to inform investigators on how to direct their search within high suitability areas identified in stage one. Specifically, this second stage considers the variables of the distance travelled from an origin, number of populated areas crossed during travel to a kill site, distances relative to populated areas in both directions from a kill site, type of ground cover and population density relative to an origin. In both of these stages computer and quantitative analyses facilitate investigation but should not replace critical and logical investigative thinking.
8.3 Final Comments

A common criticism of predictive modelling is that it is reductionist: it oversimplifies complex situations or phenomena. While this might be an argument for avoiding modelling, I would contend that the modelling process is worthwhile because it demonstrates the degree of complexity of certain behaviour, highlighting the interrelatedness of multiple causes behind an effect. Until we examine these relationships more closely and quantify that which is quantifiable we are left with only anecdote and allegation.

In the specific case of Nationalist rearguard killings and clandestine burials from the Spanish Civil War, spatial analysis and modelling have shown what can be effectively modelled, with what precision and what cannot be modelled. Some of the analytical restrictions are not necessarily due to the ephemeral nature of perpetrator behaviour but are the result of limited accessibility and quality of data for this study. Rather than being seen as a frustration, these problems are considered as a fair reflection of the circumstances that exist in many forensic contexts. A well-performing but non-realizable model in the “real world” is of little use. The availability of tools and data, however, vary considerably from case to case. I have worked for powerful governments with tremendous resources, allowing for comprehensive investigation. I have also worked as part of an investigative team for which there was extremely little in terms of resources (material, financial, etc.) and political disinterest meant that the prospect of conducting spatial analyses and creating predictive models to support victim location was nil.

In the four years of my doctoral research and fieldwork in Spain, exhumations have continued apace and although in some respects the work has improved (e.g., funding
from the national government and the production of professional reports have both increased), other events threaten to destroy any opportunity of investigations becoming a formal, routine and professional endeavour (e.g., the prevarication trial of Judge Garzón). It is disheartening to think that this and other research might fail not only to be used but even to be considered on account of the dire situation of resources and attention given to investigations in Spain. For places like Darfur or the Democratic Republic of Congo, such work must seem an absurd suggestion.

There remains the possibility, however, that such research will demonstrate the feasibility of the location of missing persons, facilitate investigations and help create momentum for further work in Spain and other places. Once proven in one context, the probability of further use in other places increases.

In 2001, Haglund et al. warned that: “in the medico-legal context archaeologists must not interpret details of human behavior and process. The medico-legal process requires documented facts and defensible expert opinion” (p. 67). More directly, behavioural scientists who have been accused of overstepping the bounds of their expertise or scientific knowledge have been called “whores of the court” and have been accused of “raping” the American justice system (Hagen 1997; Edwards et al. 2009). Hyperbole aside, these warnings and accusations are not without grounding and there are many precedents of false convictions based on “expert” witness testimony. Nevertheless, bad practice of science does not make science bad.

Quantitative analysis of killer behaviour in the investigation of disappeared persons is valuable and legitimate if it saves time and resources in facilitating a more effective search for victims. Predictive modelling as a tool for forensic investigation
should be used to find victims. It is the victims themselves, their trauma, material culture and the context of their burials that serve as evidence of what happened, to whom, how and who is responsible. There may be cases of discovered graves of those whose identity cannot be demonstrated other than that a predictive model indicated that persons $x$ and $y$ would be found in that area. Such circumstances might be argued as evidence of legally acceptable identity. In such a case Haglund’s warning may be *apropos*.

As of 2008, however, only about 8% of those exhumed from the Spanish Civil War era (about 4,000 in 2008), have been positively identified using various methods (Jiménez 2008). Spatial analysis and predictive modelling may go beyond facilitating site discovery to provide presumptive identifications. This information can then be used to provide a narrowed pool of candidates for targeted DNA analysis. This is particularly important considering that victim families are paying for the analyses. The establishment of presumptive identifications would help ensure that limited funds are well spent. With every positive confirmation of a presumptive identification, the likelihood is increased that spatial analyses and predictive modelling will stand the test of legal admissibility with respect to identities. Alternatively, if presumptive identifications based on modelling are demonstrated to be mistaken, we will better recognize the limitations of a model and endeavour to improve it. Either way, continued use and development of models can help us better define the parameters of investigations and, if effective, will result in the discovery, recovery and repatriation of further victims. Ríos *et al.* (2010) have noted the need for a multi-disciplinary approach to the identification of Spanish Civil War victims, citing shortcomings with singular approaches such as anthropological or DNA methods. The authors advocate a combined application of archaeological, osteological,
archival/historical and genetic research, of which spatial analyses and predictive modelling could easily be a part.

In the field of forensic anthropology and archaeology there has been very little application and publication dedicated to spatial analysis and effectively none using predictive modelling. This study has shown that both, particularly combined, can make a positive contribution to investigations of missing persons who are victims of a large-scale wave of repression and enforced disappearances. The limits of such analyses – both for reasons of available and applicable data and also natural limits of the ability to quantify and generalize human behaviour – are not insignificant. In this sense, this study reaffirms advice given by Buslik and Maltz (1996) that computers should be used for crime analysis not as an “autopilot” but as “power steering”.

This study has demonstrated the utility of spatial analysis and predictive modelling, despite various limitations. The good news is that one of the more serious limitations of limited, appropriate map data are changing. The quality and availability of digital data and software are increasing at an incredible rate. The best of what is available now for Canada and the United States could easily be true also for Guatemala in a few years. This gives hope for the adoption and development of the methods used in this study.

Beyond the usefulness of the methods used in this study, is there a need for them? Social anthropologist Francisco Ferrándiz (2008:179, 180) said of Civil War investigations in Spain:

exhumations provide a bridge between the political production of terror and the intimate experiences of those defeated in the war... [exhumations are] social, cultural and political performances of a ghastly public secret...
[that] create a unique, short-lived environment where testimonies of repression and suffering, direct and indirect, are particularly valued and in high demand... some of those directly affected by the past shootings and the present excavation of the crime scene may find in the exhumation a privileged public space for the telling of their stories – one that in many cases has been totally lacking to them previously.

In this sense, although justice in the strict sense is being denied the victims and their families, the discovery and excavation of victim graves is helping re-write recent Spanish recent history based on facts, rather than dictatorship propaganda. Zapico Barbeito (2010:273) strengthens the argument for the investigation of the graves of the missing:

There is not, nor will there ever be any forgetting and pardoning without justice because time does not heal wounds caused by crimes as abominable and outrageous as enforced disappearances in a context of crimes against humanity.

To many people outside of Spain, particularly those who have not experienced war, the exhumations of those who died or were killed during the Spanish Civil War may not seem controversial or even important. Within Spain, exhumations of Republicans from clandestine graves have caused great controversy, despite 74 years having passed since the time of most of these killings. This thesis was designed to facilitate more effective grave location for excavation because I have no doubt that the benefits of the exhumations far outweigh the discomfort, expense and debate that they cause.

In 1998 and 1999, armed combat in Kosovo claimed the lives of thousands of civilians. In 2000, I assisted investigations as part of a United Nations forensic team. An old man, the family member of a victim we had exhumed, said to me: “I know that some people here do not like what you are doing and do not want you to do it. I have lived in the west, and I know how you think. I know you want to help”. I suspect that this man
had invited me to have coffee with him so that he could warn me, rather than show his support. Forensic teams had been sent from NATO countries and tasked with finding the dead and proving that they had been slaughtered. This would justify NATO’s bombing campaign of the Serbian army and paramilitary who had been killing Kosovars. A similar role was played by forensic teams working for the United States government digging up mass graves in Iraq, which would help people forget that Iraq had been attacked for allegedly possessing and hiding weapons of mass destruction. The old man in Kosovo wanted me to understand that our investigation, which focussed on numbers of victims for the genocide trial of the Serbian president rather than identifying individual victims and prosecuting individual killers, was helping NATO as much as, if not more than Kosovo.

My experiences in Kosovo and Iraq, among other places, have not fundamentally changed my opinion about the great importance of international criminal investigations. Nevertheless, conversations with families of victims have taught me that it is they who should mandate how and why investigations are lead. This study was conceived to help Spaniards – be they medico-legal scientists employed by the government or concerned local citizens – investigate crimes committed in Spain. The patterns of grave locations in Spain are the result of rational decisions made by paramilitary killers. Similar killers are active elsewhere and I hope that further study in other places will help to understand their behaviour, prevent further killings and assist in the location, documentation and identification of their victims.
### Appendix A. Table of Exhumations of Republican Victims

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Graves excavated/bodies exhumed</th>
<th>Organization or individuals responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Carretera local Bayubas-Tajueco, Soria</td>
<td>8 exhumed</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1970s</td>
<td>Extremadura</td>
<td>unknown</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1971, June 11</td>
<td>Bayubas de Abajo, Soria</td>
<td>16 exhumed</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1972, May 8</td>
<td>Retortillo, Salamanca.</td>
<td>5 exhumed</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1972</td>
<td>“la Bardera de los perejones”, Valdenebro, Soria</td>
<td>1 exhumed</td>
<td>Family of victim</td>
</tr>
<tr>
<td>“Before 1975”</td>
<td>Seville</td>
<td>9 graves excavated</td>
<td>Unknown</td>
</tr>
<tr>
<td>1975-1982</td>
<td>Seville</td>
<td>12 graves, exhumed 1,500</td>
<td>Unknown</td>
</tr>
<tr>
<td>1977, June 9</td>
<td>“Barranco Villar”, Montuenga de Soria, Soria</td>
<td>1 exhumed</td>
<td>Family of victim</td>
</tr>
<tr>
<td>1978</td>
<td>Autol, La Rioja</td>
<td>9 exhumed</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1979</td>
<td>Calahorra cemetery, La Rioja</td>
<td>8 exhumed</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1979, March 18</td>
<td>Alcanadre, La Rioja</td>
<td>1 exhumed</td>
<td>Family of the victim</td>
</tr>
<tr>
<td>1979, April 14-Nov 10</td>
<td>Venta de Valcorba; “Casetas camareros” Ausejo de la Sierra; Montenegro de Cameros; “Puente Corral Sabina”, Centenera del Campo; “Rabanera”, San Pedro Manrique; “Campoespacio” Calatañazor, Soria</td>
<td>3; 4; 1; 6; 3 exhumed from respective graves</td>
<td>Families of victims</td>
</tr>
<tr>
<td>1981, May 16-Aug 14</td>
<td>“Llanos de Chavaler”, Garray; Portelrubio; “Pasillo del medio”, Lubia; “Las Callejuelas”, Fuentelcarro, Soria</td>
<td>4; 5; 9; 1; and 11 exhumed from respective graves</td>
<td>Families of the victims</td>
</tr>
<tr>
<td>1982</td>
<td>Sevilla</td>
<td>11 exhumed</td>
<td>Unknown</td>
</tr>
<tr>
<td>1982, Nov 17</td>
<td>Aguilar de Río Alhama, La Rioja</td>
<td>6 exhumed</td>
<td>Families of the victims</td>
</tr>
<tr>
<td>2000</td>
<td>Priaranza del Bierzo (León)</td>
<td>13 exhumed from single grave</td>
<td>Families of the victims</td>
</tr>
<tr>
<td>Date</td>
<td>Place</td>
<td>Graves excavated/bodies exhumed</td>
<td>Organization or individuals responsible</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>---------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>2001</td>
<td>Fresnedo, El Bierzo</td>
<td>4 exhumed</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Ávila, Burgos, Guipúzcoa, León, Palencia, Valladolid</td>
<td>38 bodies exhumed</td>
<td>ARMH; Aranzadi</td>
</tr>
<tr>
<td>2003</td>
<td>e.g., Burgos, Jaén, Segovia, Valladolid</td>
<td>284 bodies exhumed from 35 sites</td>
<td>ARMH; Aranzadi; Foro</td>
</tr>
<tr>
<td>2004</td>
<td>e.g., Burgos, Cuenca, Santaella, La Guijarrosa, Sepúlveda (Segovia), Valladolid</td>
<td>216 exhumed</td>
<td>ARMH; Aranzadi; Foro</td>
</tr>
<tr>
<td>2005</td>
<td>e.g., Guerrillero en Valverde del Camino, Navarra, Palomares del Río (Sevilla)</td>
<td>150 exhumed</td>
<td>ARMH; Aranzadi; Foro</td>
</tr>
<tr>
<td>2006</td>
<td>e.g., Burgos, Cuenca, Valladolid</td>
<td>235 exhumed</td>
<td>ARMH, Aranzadi</td>
</tr>
<tr>
<td>2007</td>
<td>e.g., Burgos, Cuenca, Extremadura, Valladolid</td>
<td>322 exhumed</td>
<td>Various</td>
</tr>
<tr>
<td>2008</td>
<td>e.g., Burgos, Catalunya, Extremadura, León, Palencia</td>
<td>146 exhumed</td>
<td>Various</td>
</tr>
<tr>
<td>2009</td>
<td>e.g., Burgos, León, Málaga</td>
<td>257 exhumed</td>
<td>Various, incl. judicial authorities in Benavente (Castilla-León)</td>
</tr>
</tbody>
</table>

The vast majority of graves excavated represent *paseos* or *sacas*, but there have also been many cemetery exhumations from prison executions and deaths (e.g., Uclés, in Cuenca) or general purges (e.g., the cemetery in Málaga). Exhumations between 2005 and 2007 at Uclés recovered 145 people who died at a Republican hospital during the war and 294 who died or were killed at the post-war prison. The exhumations in Malaga recovered 2,840 bodies between 2006 and 2008.

Many grave excavations and exhumations took place in the provinces of Soria and La Rioja in the late 1970s and early 1980s although specific details, including dates, were not reported by the original authors (Hernández García [1984] and Herrero Balsa and Hernández García [1982]) or could not be located by the author of this study.

Sources: ARMH; ARMH Cuenca; Barragán and Fernández (2008); Baviano (1980); Bocanegra (2008); Encarnación (2008); Etxeberria (2009); Gómez and Junquera (2008); Hernández García (1984); Herrero Balsa and Hernández García (1982); Silva and Macías (2003)
Appendix B. Gravesite Data Form (English translation)

Date:

Name of site:

GPS coordinates:

Site type (e.g., cemetery, field, roadside ditch):

Location (province, municipality, etc.):

Source of information (witness, local, family member of victim):

Event details:

Date of killing(s):

What were the circumstances of the area at the time of the killings (was there fighting in or round the origin town? Did the area go to the Nationalists from the beginning? Was there a fight for power? Dates?)

Who shot the victims? Were they locals?

Who buried the victims?

Were the victims shot at the grave or brought to the grave post-mortem?

How did the victims arrive at the grave (by truck, walking)?

Was the military front close by at the time of the killings?

Grave details:

Number of victims:
Victim identification (professional membership or association, work/post, etc.):

Geographic aspects

Place of “arrest”:

Place of detention (if any):

Distance between places of arrest, detention and burial:

Place of death:

Closest town and distance:

Distance between the grave and the closest road:

Elevation of the grave from the road:

Were there trees or other cover in the area at the time of the burial?

Cemetery site, yes: inside or outside?
   No: distance to the closest cemetery:

View from the grave:

Can the nearest town be seen?

Can the nearest road be seen?

Are the current roads as they were at the time of the killing?

Is the nearest town the same size as it was at the time of the killing?

Who were the civil and military commanders at the time of the killings

Other details (on reverse)?
### Appendix C. Sources and Details of Map Layers Analyzed

<table>
<thead>
<tr>
<th>Map layer</th>
<th>Data Format</th>
<th>Scale of original paper maps</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detention sites</td>
<td>Point</td>
<td>N/A</td>
<td>GPS coordinates, site photographs and location descriptions from excavation and other reports</td>
</tr>
<tr>
<td>Gravesites</td>
<td>Point</td>
<td>N/A</td>
<td>GPS coordinates, site photographs and location descriptions from excavation and other reports</td>
</tr>
<tr>
<td>Non-sites</td>
<td>Point</td>
<td>N/A</td>
<td>Generated using ArcMap 9.3</td>
</tr>
<tr>
<td>Populated areas</td>
<td>Point</td>
<td>Unknown</td>
<td><a href="http://www.mapcruzin.com">www.mapcruzin.com</a></td>
</tr>
<tr>
<td>Municipality population densities</td>
<td>Polygon</td>
<td>Unknown, likely 1:50,000 (government standard)</td>
<td>Spanish remote server (Web Map Service, WMS): <a href="http://www.idee.es/CatalogoServicios/cat2/indexWMS.html">http://www.idee.es/CatalogoServicios/cat2/indexWMS.html</a></td>
</tr>
<tr>
<td>Primary, secondary and tertiary roads</td>
<td>Polyline</td>
<td>1:50,000; 1:25,000</td>
<td>Autonomous University of Madrid; OpenStreetMap.org and the autonomous community government of La Rioja</td>
</tr>
<tr>
<td>Autonomous communities and provinces</td>
<td>Polygon</td>
<td>1:50,000; 1:25,000</td>
<td>Autonomous University of Madrid</td>
</tr>
<tr>
<td>1930s/40s topography, roads, towns</td>
<td>PDFs, scanned from paper maps</td>
<td>1:50,000; 1:25,000</td>
<td>The National Geographic Institute of Spain (<a href="http://www.ign.es/cartoteca">www.ign.es/cartoteca</a>)</td>
</tr>
</tbody>
</table>
### Appendix D. Site Data, N=44

<table>
<thead>
<tr>
<th>Site name</th>
<th>Province</th>
<th>Origin</th>
<th>Origin X</th>
<th>Origin Y</th>
<th>Kill Site X</th>
<th>Kill Site Y</th>
<th># of Victims</th>
<th>Distance Traveled</th>
<th>Towns passed</th>
<th>Last town</th>
<th>Next town</th>
<th>Date (D/M/Y)</th>
<th>Cover</th>
<th>Day/Night</th>
<th>Road side</th>
<th>Road type</th>
<th>Origin density Change</th>
<th>Origin density</th>
<th>Origin population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altable</td>
<td>Burgos</td>
<td>Sajazarra, Cuzcurrita de Rio</td>
<td>503008</td>
<td>4714982</td>
<td>493672</td>
<td>4717321</td>
<td>7</td>
<td>13.72</td>
<td>0</td>
<td>13.7</td>
<td>2</td>
<td>18/8/36</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1040</td>
</tr>
<tr>
<td>Ampudia</td>
<td>Palencia</td>
<td>Medina de Rioseco</td>
<td>330648</td>
<td>4638338</td>
<td>347903</td>
<td>4644762</td>
<td>9</td>
<td>20.67</td>
<td>2</td>
<td>14.8</td>
<td>5.27</td>
<td>9/8/36</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4300</td>
</tr>
<tr>
<td>Arandiga</td>
<td>Zaragoza</td>
<td>Arandiga</td>
<td>625340</td>
<td>4596486</td>
<td>624824</td>
<td>4597565</td>
<td>8</td>
<td>1.64</td>
<td>0</td>
<td>1.64</td>
<td>4</td>
<td>25/8/36</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1300</td>
</tr>
<tr>
<td>Areas Ponteareas*</td>
<td>Pontevedra</td>
<td>O Porriño</td>
<td>532626</td>
<td>4667426</td>
<td>539041</td>
<td>4669569</td>
<td>5</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>0.5</td>
<td>29/12/36</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>7900</td>
</tr>
<tr>
<td>Balboa*</td>
<td>Leon</td>
<td>Corullón</td>
<td>678978</td>
<td>4716750</td>
<td>669564</td>
<td>4729120</td>
<td>4</td>
<td>19.8</td>
<td>5</td>
<td>0.79</td>
<td>1.23</td>
<td>14/0/36</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4700</td>
</tr>
<tr>
<td>Barahona</td>
<td>Soria</td>
<td>Barahona, lomilla del medio</td>
<td>528848</td>
<td>4571525</td>
<td>531448</td>
<td>4568972</td>
<td>3</td>
<td>3.57</td>
<td>0</td>
<td>3.57</td>
<td>6.75</td>
<td>20/3/36</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>700</td>
</tr>
<tr>
<td>Benegiles</td>
<td>Zamora</td>
<td>Benegiles</td>
<td>280314</td>
<td>4611659</td>
<td>279775</td>
<td>4611018</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>9.02</td>
<td>14/10/36</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>700</td>
</tr>
<tr>
<td>Berlangas de Roa</td>
<td>Burgos</td>
<td>Adrada de Haza</td>
<td>431354</td>
<td>4605334</td>
<td>428245</td>
<td>4615325</td>
<td>5</td>
<td>11.28</td>
<td>2</td>
<td>0.79</td>
<td>12.3</td>
<td>24 or 25/8/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>677</td>
</tr>
<tr>
<td>Canillas de Esqueva</td>
<td>Valladolid</td>
<td>Hermedes de Cerrato</td>
<td>402610</td>
<td>4630499</td>
<td>405315</td>
<td>4627627</td>
<td>12</td>
<td>5.3</td>
<td>0</td>
<td>5.3</td>
<td>6.75</td>
<td>13/10/36</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>620</td>
</tr>
<tr>
<td>Carucedo*</td>
<td>Leon</td>
<td>Ponferrada</td>
<td>696652</td>
<td>4713277</td>
<td>681837</td>
<td>4705976</td>
<td>4</td>
<td>20.78</td>
<td>3</td>
<td>1.43</td>
<td>9.2</td>
<td>10/8/38</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>11700</td>
</tr>
<tr>
<td>Cincovillas</td>
<td>Guadalajara</td>
<td>Cedejas del Pedrastro</td>
<td>510425</td>
<td>4537804</td>
<td>514201</td>
<td>4560010</td>
<td>3</td>
<td>24.42</td>
<td>2</td>
<td>4.92</td>
<td>2.1</td>
<td>20/3/37</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>-2</td>
<td>400</td>
</tr>
<tr>
<td>Fustiñana</td>
<td>Navarra</td>
<td>Tudela (prison)</td>
<td>615535</td>
<td>4657981</td>
<td>627170</td>
<td>4655720</td>
<td>7</td>
<td>15</td>
<td>2</td>
<td>3.12</td>
<td>N/A</td>
<td>20/11/36</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>12000</td>
</tr>
<tr>
<td>Grajal de Campos</td>
<td>Leon</td>
<td>Sahagun de Campos</td>
<td>332351</td>
<td>4692741</td>
<td>325795</td>
<td>4691986</td>
<td>2</td>
<td>7.6</td>
<td>0</td>
<td>7.6</td>
<td>3.86</td>
<td>19/9/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>3200</td>
</tr>
<tr>
<td>Guaza de Campos</td>
<td>Palencia</td>
<td>Paredes de Nava</td>
<td>359835</td>
<td>4668097</td>
<td>344719</td>
<td>4666407</td>
<td>8</td>
<td>15.8</td>
<td>1</td>
<td>3.12</td>
<td>2.39</td>
<td>3/9/36</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>4450</td>
</tr>
<tr>
<td>Izagre-Albires 1</td>
<td>Leon</td>
<td>Convento de San Marcos</td>
<td>290247</td>
<td>4717645</td>
<td>314598</td>
<td>4678674</td>
<td>11</td>
<td>48.25</td>
<td>9</td>
<td>2.12</td>
<td>4.5</td>
<td>?/10/36</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>43000</td>
</tr>
<tr>
<td>Izagre-Albires 2</td>
<td>Leon</td>
<td>Mansilla de las Mulas</td>
<td>301579</td>
<td>4707685</td>
<td>314598</td>
<td>4678674</td>
<td>2</td>
<td>31.2</td>
<td>4</td>
<td>1.66</td>
<td>4.86</td>
<td>&quot;mid-9&quot;/36</td>
<td>1</td>
<td>1</td>
<td>?</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1720</td>
</tr>
<tr>
<td>Name</td>
<td>Province</td>
<td>Origin</td>
<td>Origin X</td>
<td>Origin Y</td>
<td>Kill Site X</td>
<td>Kill Site Y</td>
<td># of Victims</td>
<td>Distance Travelled</td>
<td>Towns passed</td>
<td>Last town</td>
<td>Next town</td>
<td>Date (D/M/Y)</td>
<td>Cover</td>
<td>Female</td>
<td>Day/Night</td>
<td>Road side</td>
<td>Road type</td>
<td>Origin density</td>
<td>Density Change</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
<td>--------------</td>
<td>------------</td>
<td>------------</td>
<td>-------------</td>
<td>-------------</td>
<td>--------------</td>
<td>-------------------</td>
<td>--------------</td>
<td>-----------</td>
<td>-----------</td>
<td>--------------</td>
<td>-------</td>
<td>--------</td>
<td>------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>La Robla</td>
<td>Leon</td>
<td>La Robla</td>
<td>285047</td>
<td>4741749</td>
<td>286156</td>
<td>4738353</td>
<td>5</td>
<td>5.16</td>
<td>0</td>
<td>5.16</td>
<td>17.1</td>
<td>13/8/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>-1</td>
<td>3300</td>
<td></td>
</tr>
<tr>
<td>Magaz de Abajo 1*</td>
<td>Leon</td>
<td>Fuentes Nuevas (&amp; other towns)</td>
<td>693171</td>
<td>4716580</td>
<td>690431</td>
<td>4718131</td>
<td>9</td>
<td>7.72</td>
<td>1</td>
<td>1.27</td>
<td>1.05</td>
<td>23/9/36</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>-2</td>
<td>400</td>
</tr>
<tr>
<td>Magaz de Abajo 2*</td>
<td>Leon</td>
<td>Cacabelos (&amp; Fuentes Nuevas)</td>
<td>687123</td>
<td>4718292</td>
<td>690390</td>
<td>4718108</td>
<td>2</td>
<td>7.72</td>
<td>1</td>
<td>1.35</td>
<td>0.97</td>
<td>23/9/36</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>-1</td>
<td>3700</td>
<td></td>
</tr>
<tr>
<td>Murrillo de Gallego 1</td>
<td>Zaragoza</td>
<td>Murillo de Gallego (&amp; other towns)</td>
<td>685324</td>
<td>4689692</td>
<td>685682</td>
<td>4690089</td>
<td>16</td>
<td>0.6</td>
<td>0</td>
<td>0.6</td>
<td>7.7</td>
<td>?/10/36</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>Murrillo de Gallego 2</td>
<td>Zaragoza</td>
<td>Agüero, Murillo de Gallego</td>
<td>685324</td>
<td>4689692</td>
<td>685738</td>
<td>4689300</td>
<td>12</td>
<td>0.57</td>
<td>0</td>
<td>0.57</td>
<td>N/A</td>
<td>19/9/36</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>720</td>
</tr>
<tr>
<td>Navarrevisca</td>
<td>Avila</td>
<td>Navarrevisca, Majavellana</td>
<td>338993</td>
<td>4469836</td>
<td>338083</td>
<td>4468901</td>
<td>1</td>
<td>1.72</td>
<td>0</td>
<td>1.72</td>
<td>1.58</td>
<td>1/10/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>-2</td>
<td>900</td>
</tr>
<tr>
<td>Naveros de Pisueña</td>
<td>Palencia</td>
<td>Sotresguido, Herrera de Pisueña</td>
<td>391141</td>
<td>4715816</td>
<td>395956</td>
<td>4703696</td>
<td>5</td>
<td>13.45</td>
<td>1</td>
<td>0.6</td>
<td>0.37</td>
<td>?/8/36</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>O Amenal*</td>
<td>A Coruña</td>
<td>Santiago de Compostela</td>
<td>539905</td>
<td>4748337</td>
<td>548747</td>
<td>4750500</td>
<td>5</td>
<td>10.45</td>
<td>2</td>
<td>0.46</td>
<td>0.86</td>
<td>20/8/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>-1</td>
</tr>
<tr>
<td>Parrillas, Los Rolllones</td>
<td>Toledo</td>
<td>Parrillas &amp; Navalcan</td>
<td>323967</td>
<td>4436526</td>
<td>323637</td>
<td>4435784</td>
<td>1</td>
<td>0.7</td>
<td>0</td>
<td>0.7</td>
<td>N/A</td>
<td>24/10 or 1/11/36</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>-1</td>
<td>1620</td>
</tr>
<tr>
<td>Parrillas, Los Alcornocales</td>
<td>Toledo</td>
<td>Navalcan</td>
<td>321041</td>
<td>4437393</td>
<td>313537</td>
<td>4435837</td>
<td>2</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>8.13</td>
<td>15/10/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>-1</td>
<td>3350</td>
</tr>
<tr>
<td>Parrillas, Cerca Nueva</td>
<td>Toledo</td>
<td>Navalcan</td>
<td>321041</td>
<td>4437393</td>
<td>318666</td>
<td>4435883</td>
<td>3</td>
<td>2.9</td>
<td>0</td>
<td>2.9</td>
<td>13.3</td>
<td>?/9-11/36</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>3350</td>
</tr>
<tr>
<td>Pepino I</td>
<td>Toledo</td>
<td>Marrupe de Toledo</td>
<td>346999</td>
<td>4439188</td>
<td>344279</td>
<td>4432371</td>
<td>5</td>
<td>8.21</td>
<td>1</td>
<td>7</td>
<td>2.96</td>
<td>?/9-10/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>832</td>
</tr>
<tr>
<td>Pepino II</td>
<td>Toledo</td>
<td>Cervera de los Montes</td>
<td>345710</td>
<td>4434796</td>
<td>344322</td>
<td>4432416</td>
<td>11</td>
<td>2.9</td>
<td>0</td>
<td>2.9</td>
<td>2.66</td>
<td>14 or 15/10/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>-1</td>
</tr>
<tr>
<td>Pinilla de la Valdería*</td>
<td>Leon</td>
<td>Destriana</td>
<td>739535</td>
<td>4690065</td>
<td>739755</td>
<td>4676408</td>
<td>6</td>
<td>14.48</td>
<td>1</td>
<td>5.9</td>
<td>2.0</td>
<td>31/7/36</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>-2</td>
<td>2100</td>
</tr>
<tr>
<td>Pinilla de la Valdería*, Castrocontigo</td>
<td>Leon</td>
<td>Astorga prison</td>
<td>741683</td>
<td>4704549</td>
<td>740120</td>
<td>4676720</td>
<td>5</td>
<td>42</td>
<td>5</td>
<td>11.0</td>
<td>4.29</td>
<td>11/9/36</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>11000</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Province</td>
<td>Origin</td>
<td># of Victims</td>
<td>Distance Travelled</td>
<td># of Roads Passed</td>
<td>Date (D/M/Y)</td>
<td>Cover</td>
<td>Female Victim</td>
<td>Day/Night</td>
<td>Road side</td>
<td>Road type</td>
<td>Female Victim Change</td>
<td>Density</td>
<td>Original Population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------</td>
<td>--------</td>
<td>--------------</td>
<td>--------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>--------</td>
<td>---------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>----------------------</td>
<td>----------</td>
<td>----------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priorranza del Bierzo*</td>
<td>Leon</td>
<td>Ponferrada</td>
<td>13</td>
<td>0.35</td>
<td>1</td>
<td>16/10/36</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-2</td>
<td>11700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quintana de Rueda</td>
<td>Leon</td>
<td>Puente Almuhey &amp; other towns</td>
<td>6</td>
<td>5.33</td>
<td>1.26</td>
<td>3/12/36</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-1</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quintanilla de Combarros*</td>
<td>Leon</td>
<td>Astorga prison</td>
<td>3</td>
<td>2.4</td>
<td>6.83</td>
<td>30/10/36</td>
<td>3</td>
<td>0</td>
<td>?</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>-2</td>
<td>11000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robledollano</td>
<td>Caceres</td>
<td>Retamosa</td>
<td>3</td>
<td>0.81</td>
<td>0</td>
<td>1/10/36</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-2</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santalla*</td>
<td>Leon</td>
<td>Ponferrada</td>
<td>5</td>
<td>1.95</td>
<td>2</td>
<td>23/9/36</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>-1</td>
<td>11700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Pedro Mallo*</td>
<td>Leon</td>
<td>San Pedro Mallo</td>
<td>1</td>
<td>1.63</td>
<td>0</td>
<td>27/11/36</td>
<td>3</td>
<td>0</td>
<td>?</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toral de Merayo*</td>
<td>Leon</td>
<td>Puente de Domingo Florez</td>
<td>3</td>
<td>4.2</td>
<td>1.26</td>
<td>29 and 30/9/36</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valverde de la Vera</td>
<td>Caceres</td>
<td>Villanueva de la Vera (calbozo)</td>
<td>3</td>
<td>0.83</td>
<td>0.8</td>
<td>2/10/36</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viguera</td>
<td>La Rioja</td>
<td>Villamediana de Iregua</td>
<td>6</td>
<td>1.79</td>
<td>2.43</td>
<td>3/12/36</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1450</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viguera</td>
<td>La Rioja</td>
<td>Entrena and Uruñuela</td>
<td>6</td>
<td>1.79</td>
<td>2.43</td>
<td>7/8/36</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Villalquite</td>
<td>Leon</td>
<td>Sorribas de Esla y Cistierna</td>
<td>3</td>
<td>4.48</td>
<td>1.79</td>
<td>16/10/36</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Villamediana</td>
<td>Palencia</td>
<td>Dueñas</td>
<td>13</td>
<td>3.4</td>
<td>17/9/36</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>4000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xinzo-Ponteareas*</td>
<td>Pontevedra</td>
<td>Vigo prison</td>
<td>8</td>
<td>1.44</td>
<td>5/4/37</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>70000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
2. Population an estimate based on those of 1930 and 1940.
3. "?” indicates uncertainty reported by witness (e.g., about a date) or inability to find information during the course of research for this study.
4. "Cover": 1= farmed field; 2= open ground/pasture; 3= lightly covered ground (incl. Orchards and vineyards); 4= heavy cover (e.g., forested).
5. "Female Victim": 0= yes; 1= no.
6. "Day/Night": 0= day; 1= night.
7. "Road side": 0= right; 1= left.
8. "Origin density" is based on a Web Map Server (WMS) made accessible by the Spanish government, which ranks population density on an 8-band scale.
## Appendix E. Non-site Values for Statistical Tests, N=97

<table>
<thead>
<tr>
<th>Pt ID</th>
<th>Detention</th>
<th>Origin Density</th>
<th>Density Change</th>
<th>Kill Site X</th>
<th>Kill Site Y</th>
<th>Rd type</th>
<th>Direction of travel</th>
<th>distance travelled</th>
<th>Distance last town</th>
<th>Distance to town</th>
<th>Dist next town</th>
<th>Towns crossed</th>
<th>Road side</th>
<th># of vics</th>
<th>Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>324299</td>
<td>2</td>
<td>S</td>
<td>7</td>
<td>6.38</td>
<td>0.65</td>
<td>1</td>
<td>2</td>
<td>15</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>7</td>
<td>5</td>
<td>-2</td>
<td>549866</td>
<td>2</td>
<td>SE</td>
<td>22</td>
<td>0.83</td>
<td>0.61</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>41</td>
<td>7</td>
<td>6</td>
<td>-1</td>
<td>531665</td>
<td>3</td>
<td>SW</td>
<td>9</td>
<td>0.6</td>
<td>1.1</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>279472</td>
<td>2</td>
<td>NE</td>
<td>11</td>
<td>0.09</td>
<td>1.6</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>398884</td>
<td>3</td>
<td>SE</td>
<td>23</td>
<td>1.48</td>
<td>2.39</td>
<td>3</td>
<td>1</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>281386</td>
<td>1</td>
<td>N</td>
<td>2</td>
<td>2</td>
<td>3.76</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>16</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>682356</td>
<td>2</td>
<td>NW</td>
<td>5</td>
<td>1.94</td>
<td>0.65</td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>42</td>
<td>5</td>
<td>7</td>
<td>2</td>
<td>27777</td>
<td>3</td>
<td>NW</td>
<td>25</td>
<td>1.74</td>
<td>1.32</td>
<td>15</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>47</td>
<td>6</td>
<td>4</td>
<td>-2</td>
<td>178900</td>
<td>2</td>
<td>W</td>
<td>13</td>
<td>2.3</td>
<td>1.92</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>26</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>279052</td>
<td>2</td>
<td>W</td>
<td>4</td>
<td>4</td>
<td>7.9</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>234212</td>
<td>2</td>
<td>W</td>
<td>23</td>
<td>2.07</td>
<td>3.16</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>31</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>406385</td>
<td>2</td>
<td>E</td>
<td>10</td>
<td>4.49</td>
<td>9.98</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>23</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>347713</td>
<td>1</td>
<td>NW</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>47</td>
<td>6</td>
<td>4</td>
<td>-2</td>
<td>180555</td>
<td>1</td>
<td>SW</td>
<td>18</td>
<td>1.27</td>
<td>6.67</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>25</td>
<td>3</td>
<td>2</td>
<td>-1</td>
<td>332736</td>
<td>1</td>
<td>SE</td>
<td>20</td>
<td>4.55</td>
<td>0.89</td>
<td>4</td>
<td>2</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>45</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>257030</td>
<td>2</td>
<td>SE</td>
<td>11</td>
<td>1.69</td>
<td>0.62</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>19</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>392135</td>
<td>2</td>
<td>NE</td>
<td>4</td>
<td>4</td>
<td>3.2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>34</td>
<td>6</td>
<td>4</td>
<td>-2</td>
<td>215025</td>
<td>1</td>
<td>NW</td>
<td>25</td>
<td>1.53</td>
<td>4.21</td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>308430</td>
<td>1</td>
<td>S</td>
<td>18</td>
<td>0.26</td>
<td>5.89</td>
<td>3</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>319977</td>
<td>3</td>
<td>SW</td>
<td>13</td>
<td>4.8</td>
<td>2.25</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>35</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>198641</td>
<td>1</td>
<td>E</td>
<td>4</td>
<td>4</td>
<td>0.87</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>27</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>309869</td>
<td>1</td>
<td>E</td>
<td>21</td>
<td>0.42</td>
<td>5.97</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>39</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>194187</td>
<td>2</td>
<td>SE</td>
<td>22</td>
<td>8.51</td>
<td>0.88</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>31</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>403749</td>
<td>1</td>
<td>N</td>
<td>9</td>
<td>3.18</td>
<td>9.12</td>
<td>1</td>
<td>1</td>
<td>16</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>22</td>
<td>5</td>
<td>3</td>
<td>-2</td>
<td>312471</td>
<td>2</td>
<td>NW</td>
<td>9</td>
<td>11.2</td>
<td>9.89</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>27</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>290134</td>
<td>2</td>
<td>S</td>
<td>6</td>
<td>6</td>
<td>3.64</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>13</td>
<td>8</td>
<td>4</td>
<td>-4</td>
<td>306326</td>
<td>2</td>
<td>E</td>
<td>21</td>
<td>5.01</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>42</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>38330</td>
<td>1</td>
<td>N</td>
<td>25</td>
<td>1.14</td>
<td>1.1</td>
<td>11</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>616433</td>
<td>2</td>
<td>NE</td>
<td>1</td>
<td>1</td>
<td>13.06</td>
<td>0</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>37</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>205569</td>
<td>1</td>
<td>NE</td>
<td>2</td>
<td>2</td>
<td>2.67</td>
<td>0</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>39</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>188314</td>
<td>1</td>
<td>NE</td>
<td>9</td>
<td>5.87</td>
<td>2.24</td>
<td>2</td>
<td>1</td>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>27</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>275832</td>
<td>2</td>
<td>NW</td>
<td>15</td>
<td>2.23</td>
<td>2.55</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>14</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>320255</td>
<td>2</td>
<td>E</td>
<td>21</td>
<td>15.4</td>
<td>2.25</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>337822</td>
<td>1</td>
<td>NE</td>
<td>9</td>
<td>0.56</td>
<td>3.91</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>323197</td>
<td>1</td>
<td>NW</td>
<td>18</td>
<td>8.89</td>
<td>1.55</td>
<td>1</td>
<td>1</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pt ID</td>
<td>Detention</td>
<td>Origin Density</td>
<td>Kill site X Density</td>
<td>Change</td>
<td>Kill Site Y Density</td>
<td>Rd type</td>
<td>Direction of travel</td>
<td>Distance last town</td>
<td>Dist next town</td>
<td>Distance between towns</td>
<td>Towns crossed</td>
<td>Road side</td>
<td># of vics</td>
<td>Cover</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>--------</td>
<td>---------------------</td>
<td>---------</td>
<td>---------------------</td>
<td>------------------</td>
<td>--------------</td>
<td>----------------------</td>
<td>--------------</td>
<td>----------</td>
<td>---------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>43</td>
<td>4</td>
<td>0</td>
<td>186047</td>
<td>4705602</td>
<td>1</td>
<td>SW</td>
<td>25</td>
<td>1.59</td>
<td>2.23</td>
<td>5</td>
<td>2</td>
<td>16</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>15</td>
<td>4</td>
<td>0</td>
<td>278595</td>
<td>4742188</td>
<td>1</td>
<td>SW</td>
<td>8</td>
<td>0.77</td>
<td>5.26</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>21</td>
<td>5</td>
<td>3</td>
<td>-2</td>
<td>323755</td>
<td>3</td>
<td>SE</td>
<td>4</td>
<td>1.56</td>
<td></td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>23</td>
<td>4</td>
<td>2</td>
<td>-2</td>
<td>346702</td>
<td>1</td>
<td>SE</td>
<td>1</td>
<td>1</td>
<td>3.14</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>-2</td>
<td>605027</td>
<td>2</td>
<td>NW</td>
<td>22</td>
<td>6.7</td>
<td>5.58</td>
<td>4</td>
<td>1</td>
<td>15</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>46</td>
<td>6</td>
<td>3</td>
<td>-3</td>
<td>188319</td>
<td>1</td>
<td>W</td>
<td>20</td>
<td>5.69</td>
<td>1.37</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>30</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>347471</td>
<td>1</td>
<td>E</td>
<td>25</td>
<td>7.57</td>
<td>2.2</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>-2</td>
<td>691416</td>
<td>2</td>
<td>SE</td>
<td>11</td>
<td>0.73</td>
<td>9.84</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>32</td>
<td>6</td>
<td>4</td>
<td>-2</td>
<td>452040</td>
<td>2</td>
<td>E</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>14</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>296285</td>
<td>2</td>
<td>SW</td>
<td>6</td>
<td>0.09</td>
<td>2.06</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>9</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>275426</td>
<td>1</td>
<td>NE</td>
<td>9</td>
<td>0.62</td>
<td>4.07</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>38</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>217210</td>
<td>1</td>
<td>E</td>
<td>16</td>
<td>2.11</td>
<td>2.08</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>20</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>340926</td>
<td>1</td>
<td>E</td>
<td>25</td>
<td>25</td>
<td>1.72</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>23</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>359496</td>
<td>1</td>
<td>E</td>
<td>23</td>
<td>15.2</td>
<td>6.93</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>20</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>328955</td>
<td>1</td>
<td>N</td>
<td>4</td>
<td>4</td>
<td>15.35</td>
<td>0</td>
<td>1</td>
<td>16</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>13</td>
<td>8</td>
<td>3</td>
<td>-5</td>
<td>280079</td>
<td>2</td>
<td>SW</td>
<td>15</td>
<td>2.75</td>
<td>4.62</td>
<td>4</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>327721</td>
<td>2</td>
<td>NE</td>
<td>9</td>
<td>4.71</td>
<td>3.98</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>331593</td>
<td>1</td>
<td>N</td>
<td>3</td>
<td>3</td>
<td>0.95</td>
<td>0</td>
<td>2</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>13</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td>288748</td>
<td>1</td>
<td>N</td>
<td>1</td>
<td>1</td>
<td>0.9</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>514000</td>
<td>1</td>
<td>N</td>
<td>13</td>
<td>1.43</td>
<td>4.63</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>20</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>319777</td>
<td>2</td>
<td>SW</td>
<td>5</td>
<td>1.34</td>
<td>14.75</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>12</td>
<td>4</td>
<td>2</td>
<td>-2</td>
<td>344754</td>
<td>2</td>
<td>S</td>
<td>19</td>
<td>19</td>
<td>3.51</td>
<td>0</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>18</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>336096</td>
<td>1</td>
<td>SE</td>
<td>24</td>
<td>21.3</td>
<td>2.69</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>541891</td>
<td>1</td>
<td>E</td>
<td>15</td>
<td>1.98</td>
<td>4.66</td>
<td>3</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>45</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>25538</td>
<td>3</td>
<td>E</td>
<td>7</td>
<td>3.45</td>
<td>7.84</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>41</td>
<td>7</td>
<td>5</td>
<td>-2</td>
<td>46760</td>
<td>2</td>
<td>E</td>
<td>23</td>
<td>1.73</td>
<td>0.63</td>
<td>2</td>
<td>2</td>
<td>9</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>35</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>192609</td>
<td>2</td>
<td>SW</td>
<td>4</td>
<td>0.92</td>
<td>0.27</td>
<td>2</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>500551</td>
<td>2</td>
<td>NW</td>
<td>18</td>
<td>5.61</td>
<td>2.83</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>47</td>
<td>6</td>
<td>3</td>
<td>-3</td>
<td>194451</td>
<td>1</td>
<td>S</td>
<td>35</td>
<td>24.2</td>
<td>17.1</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>28</td>
<td>6</td>
<td>4</td>
<td>-2</td>
<td>517814</td>
<td>3</td>
<td>W</td>
<td>34</td>
<td>0.08</td>
<td>3.15</td>
<td>5</td>
<td>2</td>
<td>15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>312065</td>
<td>2</td>
<td>NW</td>
<td>33</td>
<td>0.16</td>
<td>3.44</td>
<td>11</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>652422</td>
<td>2</td>
<td>E</td>
<td>30</td>
<td>28</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>36</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>259131</td>
<td>3</td>
<td>S</td>
<td>26</td>
<td>3.46</td>
<td>0.72</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>47</td>
<td>6</td>
<td>3</td>
<td>-3</td>
<td>186124</td>
<td>2</td>
<td>S</td>
<td>37</td>
<td>23.2</td>
<td>18.1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>43</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>216773</td>
<td>1</td>
<td>SE</td>
<td>34</td>
<td>2.24</td>
<td>5.4</td>
<td>7</td>
<td>1</td>
<td>13</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>21</td>
<td>5</td>
<td>4</td>
<td>-1</td>
<td>348250</td>
<td>2</td>
<td>NE</td>
<td>33</td>
<td>14.7</td>
<td>9.39</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>366926</td>
<td>3</td>
<td>E</td>
<td>27</td>
<td>4.92</td>
<td>5.88</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>29</td>
<td>4</td>
<td>1</td>
<td>-3</td>
<td>527920</td>
<td>2</td>
<td>S</td>
<td>35</td>
<td>6.38</td>
<td>0.74</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Pt ID</td>
<td>Detention</td>
<td>Origin Density</td>
<td>Density</td>
<td>Kill site X</td>
<td>Kill Site Y</td>
<td>Rd type</td>
<td>Direction of travel</td>
<td>Distance travelled</td>
<td>Distance last town</td>
<td>Dist next town</td>
<td>Dist to town</td>
<td>Towns crossed</td>
<td>Road side</td>
<td># of vics</td>
<td>Cover</td>
</tr>
<tr>
<td>-------</td>
<td>-----------</td>
<td>----------------</td>
<td>---------</td>
<td>-------------</td>
<td>-------------</td>
<td>---------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------</td>
<td>----------</td>
<td>-------</td>
</tr>
<tr>
<td>67</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>511795</td>
<td>4590783</td>
<td>NW</td>
<td>33</td>
<td>4.25</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>41</td>
<td>7</td>
<td>5</td>
<td>-2</td>
<td>25880</td>
<td>4714466</td>
<td>W</td>
<td>37</td>
<td>0.99</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>19</td>
<td>4</td>
<td>2</td>
<td>-2</td>
<td>417229</td>
<td>4729641</td>
<td>NE</td>
<td>37</td>
<td>5.83</td>
<td>3</td>
<td>2</td>
<td>12</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>-2</td>
<td>655500</td>
<td>4601599</td>
<td>NE</td>
<td>34</td>
<td>32</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>303291</td>
<td>4655846</td>
<td>W</td>
<td>35</td>
<td>9.24</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>17</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>683619</td>
<td>4671384</td>
<td>S</td>
<td>25</td>
<td>8.47</td>
<td>4</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>36</td>
<td>6</td>
<td>3</td>
<td>-3</td>
<td>251177</td>
<td>4728339</td>
<td>N</td>
<td>25</td>
<td>3.37</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>604487</td>
<td>4686136</td>
<td>N</td>
<td>34</td>
<td>4.51</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>24</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>329642</td>
<td>4452299</td>
<td>NW</td>
<td>36</td>
<td>8.99</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>10</td>
<td>5</td>
<td>4</td>
<td>-1</td>
<td>608022</td>
<td>4701919</td>
<td>N</td>
<td>37</td>
<td>12.7</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>301336</td>
<td>4638678</td>
<td>NE</td>
<td>34</td>
<td>1.7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>34</td>
<td>6</td>
<td>4</td>
<td>-2</td>
<td>179599</td>
<td>4730274</td>
<td>NW</td>
<td>25</td>
<td>0.17</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>42</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>13267</td>
<td>4655155</td>
<td>SW</td>
<td>24</td>
<td>1.49</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>11</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>290853</td>
<td>4716309</td>
<td>NW</td>
<td>37</td>
<td>3.34</td>
<td>10</td>
<td>2</td>
<td>13</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>43</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>221735</td>
<td>4734780</td>
<td>NE</td>
<td>28</td>
<td>1.17</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>23</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>361185</td>
<td>4424091</td>
<td>SE</td>
<td>33</td>
<td>18</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>18</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>359589</td>
<td>4488206</td>
<td>NE</td>
<td>32</td>
<td>8.62</td>
<td>4</td>
<td>1</td>
<td>14</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>39</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>152687</td>
<td>4707074</td>
<td>SW</td>
<td>26</td>
<td>4.18</td>
<td>6</td>
<td>1</td>
<td>13</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>41</td>
<td>7</td>
<td>6</td>
<td>-1</td>
<td>33044</td>
<td>4714263</td>
<td>W</td>
<td>28</td>
<td>4.49</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>16</td>
<td>4</td>
<td>4</td>
<td>-2</td>
<td>239166</td>
<td>4715746</td>
<td>E</td>
<td>43</td>
<td>2.9</td>
<td>7</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>-1</td>
<td>668468</td>
<td>4713933</td>
<td>NW</td>
<td>35</td>
<td>10.9</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

Sites 8, 27, and 32 were deleted for their being unable to meet the parameters of travel (e.g., the direction and distance assigned placed the kill site in the Atlantic Ocean).

Origin points numbered 47 according to the original site sample before removal of three sites for final analysis and modelling.
Appendix F. Sites and Non-sites in Castilla-Leon

Study area sites and nonsites

Legend
- Graves
- Nonsites
- Castilla Leon
Abbott, A.

Allen, K.M.S., S.W. Green, and E.B.W. Zubrow

Álvaro Dueñas, M.

Altschul, J.A.

Amnistía Internacional

Anselin, L.

Anselin, L

Areh, I. and P. Umek
Arendt, H.  

Armengou, M. and R. Belis  

Aróstegui, J.  

Ashmore, W.  

Associated Press  

Atholl, K.  

Auerbach, R.  

BBC  

Badcock, J.  
2005 Saved by the war. *Index on Censorship* 2:68-71.

Bahamonde, A.  
2005 *Un año con Queipo de Llano*, Sevilla: Espuela de Plata.

Ballbé, E. and D.W. Steadman  

Barcalá, D.  
Barragan, D. and J.L. Fernández
2008 Arqueología de la Justicia. Arqueología de las víctimas de la Guerra Civil Española y de la represión franquista. Rampas (7).

Bass, W.M. and W.H. Birkby

Baviano, J.M.

Beevor, A.

Benassar, B.

Bernardi, P. and L. Fondebrider

Blau, S. and M. Skinner

Blau, S. and D.H. Ubelaker
2009 Handbook of Forensic Anthropology and Archaeology, Walnut Creek, California: Left Coast Press.

Bocanegra, R.

Botella López, M.C.
2009 Personal communication with Professor of Anthropology, University of Granada, Spain.

Boyd, C.P.

Boyle, R.
Brandt, R., B.J. Groenewoudt, and K.L. Kvamme
1992 An experiment in archaeological site location: Modeling in the

Brantingham, P.J. and P.L. Brantingham

Brantingham, P.J. and P.L. Brantingham

Brantingham, P.J. and P.L. Brantingham
1993 Nodes, paths and edges: Considerations on the complexity of crime and
the physical environment. *Journal of Environmental Psychology* 13(1): 3-
28.

Brantingham, P. and P. Brantingham
1995 Criminality of place: Crime generators and crime attractors. *European

Brenan, G.

Brenan, G.

Buck, S.C.
2003 Searching for graves using geophysical technology: Field tests with
ground penetrating radar, magnetometry and electrical resistivity. *Journal

Burnett, V.
November 19.

Buslik, M. and M. Maltz
1998 Power to the people: Crime mapping and information sharing in the
Chicago Police Department, pp. 113-130 in *Crime Mapping and Crime
Prevention* by D. Weisburd and J.T. McEwen (eds.), Monsey, New York:
Criminal Justice Press.

Calatrava, J.A.
1991 El debate sobre la ubicación de los cementerios en la España de las Luces:
la contribución de Benito Bails, *Espacio, Tiempo y Forma, Serie VII,
Historia del Arte*, t. 4:349-366.

Campbell, B.B.
2002 Death squads: definition, problems, and historical context, in: *Death
Squads in Global Perspective: Murder with Deniability* by B.B. Campbell
Campbell, B.B. and A.D. Brenner  

Cannon, A.  

Canter, D. and S. Hodge  

Carmelina Bruno, L.  

Carver, S.J.  

Casas de la Vega, R.  

Casanova, J.  

Casanova, J.  

Casanova, J. (ed.)  

Casqueiro, J. and L.R. Aizpelolea  

Castro, L.  
2006 *Capital de la Cruzada; Burgos durante la Guerra Civil*, Barcelona: Crítica.

Cenaro, A.  
Chainey, S. and J. Ratcliffe

Chalk, F.
2005  “Atrocity Crimes” and the Darfur Crisis, available online at:

Chaves Palacios, J.
1995  *La represión en la provincial de Cáceres durante la Guerra Civil*,
Cáceres: Universidad de Extremadura.

Chaves Palacios, J.
2004  Historiografía sobre la Guerra Civil 1936-1939: Extremadura, *Historia
Actual Online* 4:85-98.

Cheetham, P.
2005  Forensic geophysical survey. Chapter 3 in: Forensic Archaeology:
Advances in Theory and Practice by J. Hunter and M. Cox. Boca Raton,
Florida: CRC Press.

Christensen, A.M. and C.M. Crowder
2009  Evidentiary standards for forensic anthropology. *Journal of Forensic

Church, T., R.J. Brandon, and G.R. Burgett
2000  GIS applications in archaeology: Method in search of theory. In Practical
135- 155.

Clarke, D.L.

Commission on Human Rights
2003  Civil and Political Rights, Including the Questions of: Disappearances
and Summary Executions. Report of the Working Group on Enforced or
Involuntary Disappearances. United Nations Commission on Human
Rights, Fifty-ninth session. Available online at: http://daccess-dds-
ny.un.org/doc/UNDOC/GEN/G03/113/18/PDF/G0311318.pdf?OpenElem-

Condor Georadar
nd  Prospección Sesma Policía Foral. Unpublished powerpoint presentation
on the use of ground penetrating radar and infrared photography for a
forensic investigation and successful prospection of a clandestine burial in
Spain.

Congram, D. and D. Bruno
2007  [Don’t] smile for the camera: Addressing perception gaps in forensic
Congram, D. and A. Fernández

Congram, D. and A. Mundorff
2009 *A call for accreditation in forensic archaeology and anthropology in Canada*. Paper presented at the annual meeting of the Canadian Association for Physical Anthropology, October 29, Vancouver, Canada.

Congram, D. and D.W. Steadman

Congram, D., M. Hoyos, and T. Caballerio
2009 Unpublished report on a mass grave prospection in Villanueva de la Vera, Cáceres Province, Spain.

Conolly, J. and M. Lake

Conner, M. and D. Scott

Connor, M. and D. Scott

Connor, M.

Cordner, S.
2005 The missing: Action to resolve the problem of those unaccounted for as a result of armed conflict or internal violence, and to assist their families, *Victorian Institute of Forensic Medicine Review* 3(1): 2-6.

Cortés, V.

Couffon, C.

Cox, M., A. Flavel, I. Hanson, J. Laver, and R. Wessling,
Crespo Prieto, A. 2008 Informe de la exhumación de una fosa común en Izagre – Albiros (León), Asociación para la Recuperación de la Memoria Histórica, September, 2008.


Dirkmaat, D. and J.M. Adovasio
1997 The role of archaeology in the recovery and interpretation of human remains from an outdoor forensic setting, in Forensic Taphonomy: The postmortem fate of human remains by W.D. Haglund and M.H. Sorg (eds.), pp. 39-64, Boca Raton, FL: CRC Press.

Dirkmaat, D., L.L. Cabo, J.M. Adovasio, and V. Rozas

Dirkmaat, D., L.L. Cabo, S.D. Ousley, and S.A. Symes

Donat, A. (ed.)
1979 The Death Camp Treblinka, New York: Holocaust Library.

Doretti, M. and C.C. Snow

Dupras, T., J.J. Schultz, S.M. Wheeler, and L.J. Williams

Dutton, D.G., E.O. Boyanowsky and M.H. Bond

Dyer, G.

Ebert, D.

Ebert, D.

Ebert, J.I.


Espinosa, F. 2006 *Contra el Olvido: Historia y Memoria de La Guerra Civil*, Barcelona: Crítica.


ESRI 2009 Using the conceptual model to create a suitability map, Release 9.3, last modified April 24, 2009.

Etxeberría Gabilondo, F.

Europa Press

Fernández E.
2009 Personal communication with international penal lawyer Eleonor Fernández, of the Victims Unit of the Extraordinary Chambers in the Courts of Cambodia.

Ferrándiz, F.

Ferrándiz, F.

Fischer, M., H. Scholten, and D. Unwin

Flavel, A. and C. Barker
2009 Forensic anthropology and archaeology in Guatemala, in: *Handbook of Forensic Anthropology and Archaeology* by S. Blau and D. Ubelaker (eds.), Walnut Creek, California: Left Coast Press.

Fondebrider, L.
2009 The application of forensic anthropology to the investigation of cases of political violence: Perspectives from South America, in *Handbook of Forensic Anthropology and Archaeology* by S. Blau and D. Ubelaker (eds.), Walnut Creek, California: Left Coast Press.

Fontecha, A., J.C. Gibaja, and F. Bernalte

Foro por la Memoria

Foro por la Memoria and Conde, J.


Ghosray, S. 2008 When does collateral damage rise to the level of a war crime?: Expanding the adequacy of laws of war against contemporary human rights discourse. *Creighton Law Review* 679-711.


Gibson, I. 2010 Personal communication by electronic mail with Professor Ian Gibson, February 1, 2010.

Gobierno de Aragón nd *Protocolo de Exhumación de Restos Humanos Relacionados con la Guerra Civil dentro del Proyecto Amarga Memoria*, Departamento de Educación, Cultura y Deporte, Gobierno de Aragón.

González-Ruibal, A.

González Calleja, E.
2003 *La violencia en política*, Madrid: CSIC.

González Cuevas, P.C.

Gould, R.J.
2007 *Disaster Archaeology*, Salt Lake City: The University of Utah Press.

Graham, H.

Hagen, M.A.

Haglund, W.D. and M.H. Sorg
1997 *Forensic Taphonomy; the post-mortem fate of human remains*, Boca Raton: CRC Press.

Haglund, W.D. and M.H. Sorg
2002 *Advances in Forensic Taphonomy; Method, theory, and archaeological perspectives*, Boca Raton: CRC Press.

Haglund, W.D., M. Connor and D.D. Scott

Hague Convention
1907 *Laws of War: Laws and Customs of War on Land (Hague IV); October 18, 1907*, available online at: http://avalon.law.yale.edu/20th_century/hague04.asp

Hernández García, A.
1984 *La represión en La Rioja durante la guerra civil*, Almazán: Ingrabel.

Herrero Balsa, G. and A. Hernández García

Herreros, F. and H. Criado
2009 Pre-emptive or arbitrary: Two forms of lethal violence in a Civil War, *Journal of Conflict Resolution* 53:419.
Hochrein, M.J.

Hodder, I. and C. Orton

Hole, B.L.

Hosmer, D. and S. Lemeshow

Hughey, J.D.

Hunter, J., C. Roberts, and A. Martin


Hunter, J. and M. Cox

ICTY

Ignatieff, M.

Ingold, T.

Iniesta López, A.
International Commission of Jurists

Jackson, G.

Jackson, G.

Jensen, G.

Jiménez, J.
2008 Oral presentation at the Seminario Internacional, el tratamiento institucional de los NN en Colombia, propuestas interdisciplinarias desde la antropología para el problema de cuerpos sin identificar. Universidad de Antioquia, Medellín, Columbia, March 3rd and 4th.

Juliá, S.

Junod, M.

Junquera, N.

Junquera, N.

Junquera, N.
Junquera, N.

Junquera, N.

Junquera, N.

Kalacska, M., L.S. Bell, A. Sanchez-Azofeifa, and T. Caelli
2009 The application of remote sensing for detecting mass graves: An experimental animal case study from Costa Rica. Journal of Forensic Sciences 54(1): 159-166.

Kalacska, M., T. Moore, and A. Costopoulos

Kalyvas, S.

Kalyvas, S.

Kiernan, B.

Killam, E.W.

Koestler, A.
Kohler, T.A.

Kohler, T.A. and S.C. Parker

Komar, D.A. and J.E. Buikstra

Krist Jr., F.J.

Kvamme, K.L.

Kvamme, K.L.

Kvamme, K.L.

Kvamme, K.L.

Kvamme, K.L.
Kvamme, K.L.

Kvamme, K.L.

Law of Historical Memory

Lázarro, J.M.
2010 El juez Varela rechaza las pruebas pedidas por Garzón. *El País*, March 9. Available online at:

Leizaola,

Leyton, E.
2005 *Hunting Humans*. Toronto: McClelland and Stewart Ltd.

Lisit, G.A., M.H. Manhein and M. Leitner

Lock, G. and T. Harris

Lundrigan, S. and D. Canter

Lundrigan, S. and D. Canter

Malczewski, J.
Manhein, M.H., G.A. Listi, and M. Leitner  

Manning, D.  
2010 Personal communication with former Police Investigation Team Leader for the Office of the Prosecutor at the International Criminal Tribunal for the former Yugoslavia (ICTY).

Martin-Arroyo, J. and V. Cortés  

Martin Barrio, A., M. de los Angeles Sampedro Talabán and M.J. Velasco Marcos  

Martín Jiménez, I.  

Maschner, H.D.G.  

Mason, R.J.  

Mehrer, M.W. and K.L. Wescott  

Melbye, J. and S. Jimenez  

Mellow, J.R.  

Melvern, L.  
Milgram, S.

Milgram, S.

Milgram, S.

Millard, A.

Moa, P.

Molina, M.
2007 Personal communication with researcher and President of the Cuenca Province chapter of the Association for the Recovery of Historical Memory (Asociación para la Recuperación de la Memoria Histórica, ARMH).

Molinero, C.M.

Moreno, F.

Moreno Gómez, F.

Moreno Gómez, F.

Morse, D., D. Crusoe, and H.G. Smith
Musselman, A.  

Myers, D.G.  

National Academy of Sciences  

Neufeld, P. and B. Scheck  

Nobes, D.C.  

Oblanca, A. and S. Serrano  
1987 La guerra civil en León, *Tierras de León*, revista de la Diputación Provincial, No. 67.

Olmo, D., A. Ginarte, C. Bisso, M. Salado Puerto, and L. Fondebrider  

Orwell, G.  
1938 *Homage to Catalonia*, London: Secker and Warburg

Oxford English Dictionary  

Owen, Lord D.  

Owsley, D.W.  

Palomares, J.M.I.  
2001 *La guerra civil en la ciudad de Valladolid*, Ayuntamiento de Valladolid.

Palomares, J.M.I.  
Parker Pearson, M.
2005 *The Archaeology of Death and Burial*. College Station, Texas: Texas A&M University Press.

Parsons, T., A. Rizvić, A. Kleise, A. Boys, A. Zinbo, M. Skinner and K. Bomberger

Payne, S.G.

Payne, S.G.

Payne, S.G.

Pedreño Gómez, J.M.
2009 Personal communication with president of the *Federación estatal de foros por la memoria*, Madrid, Spain.

Pons Prades, E.
2006 *Las escuadras de la muerte*, Barcelona: Flor del Viento Ediciones.

Power, S.

Prada Rodríguez, J.

Prado, B.

Preston, P.

Preston, P.
2001 *Palomas de la guerra: cinco mujeres marcadas por el enfrentamiento bélico*. Barcelona: Plaza y Janes.
Preston, P.  

Puell de la Villa, F. and J.A. Huerta Barajas 

Radiocable.com 

Ranzato, 

Reddick, A. 

Rees, L. 
2005 Auschwitz, London: BBC.

Regan, P.M. 
2009 Sixteen Million One; Understanding civil war, Boulder, CO: Paradigm Publishers.

Reig Tapia, A. 
1979 En torno al estudio de la represión franquista. Tiempo de Historia 58(11).

Reig Tapia, A. 

Reig Tapia, A. 

Reig Tapia, A. 

Renfrew, A.C. 

Renfrew, A.C. and C.J. Cherry 
Rilova Pérez, I.

Ríos, L., J.I. Casado Ovejero and J. Puente Prieto

Richards, M.
2007 Los límites de la cuantificación: represión franquista y la metodología histórica. *Hispania Nova 7*.

Rilova Pérez, I.

Rodero, J., J. Moreno Tascón and J. Castrillo Yagüe

Rodrigo, J.

Roksandic, M.

Romero Valiente, J.M.

Ron, J.

Rosa, I.

Rossmo, K.

Ruiz, J.

Ruiz, J.
2009 Seventy years on: Historians and repression during and after the Spanish Civil War. *Journal of Contemporary History* 44:449-472.
Schultz, J.J.

Schwarz, K.R. and J. Mount

Scott, D.D. and M. Connor

Sebastian, L. And W.J. Judge

Sender Barayon, R.

Sevillano Calero, F.
2004  *Exterminio; El terror con Franco*. Madrid: Oyeron.

Shennan, S.

Sigler-Eisenberg, B.

Silber, L and A. Little

Silva, E. and S. Macias

Simmons, T. and M. Skinner

Skinner, M.
Skinner, M.
2010 Personal communication with Professor Mark Skinner at Simon Fraser University (Canada) and Diplomate of the American Board of Forensic Anthropology.

Skinner, M. and K. Bowie

Skinner, M. and R. Lazenby

Skinner, M., D. Alempijevic, and M. Djuric-Srejic

Skinner, M., H.P. York, and M.A. Connor

Smeulers, A.
1996 Auschwitz and the Holocaust through the eyes of the perpetrators, Driemaandelyks tijdschrift van de stichting Auschwitz, p. 23-55.

Snook, B., R.M. Cullen, A. Mokros, and S. Harbort


Staub, E.

Steele, C. and D. Congram
2008 Humanitarian and Forensic Mass Grave Excavations, paper presented to the Society of Historical Archaeology annual meeting, Alburquerque, New Mexico.
Sterenberg, J.  
2010 Personal communication with forensic archaeologist and former employee of the International Criminal Tribunal for the former Yugoslavia and the International Commission for Missing Persons.

Stover, E. and R. Shigekane  
2002 The missing in the aftermath of war: When do the needs of victims’ families and international war crimes tribunals clash? International Review of the Red Cross 84(848):845-866.

Strongman, K.B.  

Sui, D.Z.  

Taylor, T.  

Thomas,  

Thorne, S.  
2008 Jargon insidious weapon in media-managed war or should that be ‘conflict’? The Canadian Press, May 2.

Toynbee, J.M.C.  

Tremlett, G.  

Tuller, H. and M. Djuric  

Tuller, H., U. Hofmeister and S. Daley  

Turnbull, L.S., E.H. Hendrix and B.D. Dent  
UNOG  

van Leusen, P.M.  

Vaughn, S. and T. Crawford  
2009  A predictive model of archaeological potential: An example from northwestern Belize, Applied Geography 29:542-555.

Vega Sombría, S.  
2005  De la esperanza a la persecución. La repression franquista en la provincial de Segovia. Barcelona: Crítica.

Veljanovski, T. and Z. Stančič  

Verhagen, P.  
2007  Case Studies in Archaeological Predictive Modelling, the Netherlands: Leiden University Press.

Verhagen, P., H. Kamermans, M. van Leusen, J. Deeben, D. Hallewas and P. Zoetbrood  

Vilaplana, R.  

Wagner, S.  

Waller, J.  
Warren, R.E.

Warren, R.E. and D.L. Asch

Webster, J.

Wescott, K.L. and R.J. Brandon (eds.)

Wescott, K.L. and J.A. Kuiper

Wheatley, D. and M. Gillings

Whitaker, J.T.
1942 Prelude to world war; A witness from Spain, Foreign Affairs 21(1) :103-119.

Woodman, P.E. and M. Woodward

Wright, R.
2010 Where are the bodies? In the ground. The Public Historian 32(1):96-107.

Wright, R., I. Hanson, and J. Sterenberg

Yoldi, J.
Zapico Barbeito, M.  

Zavala, J.M.  